



## Andromeda Metals Limited ASX: ADN

# ASX Announcement

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## The 2023 DFS delivers significantly improved economics, following a comprehensive strategy review establishing an enhanced product portfolio in high value markets

Andromeda Metals Limited (**ASX: ADN**) (**Andromeda, the Company**) is pleased to release the results of an updated Definitive Feasibility Study (**2023 DFS**) following a comprehensive commercial strategy review and approach to developing the world-class, high quality Great White Deposit. The Great White Project (**TGWP, The Project**) is construction ready with the required permits in place.

The Great White Project Net Present Value (**NPV**) increases by 65% to \$1,010 million<sup>1</sup>, and average annual earnings before interest tax depreciation and amortisation (**EBITDA**) increases by 59% to \$130 million.

The **increased** NPV compared to the 2022 DFS, primarily results from:

- **Strengthened global prices driven by geopolitical risk and global and regional supply shortages**
- **Enhanced product mix and partner portfolio**
- **Established high value in use of Andromeda products in key market segments**
- **An updated mine development plan (based on the Mine to Market response) that supports an accelerated sales profile and reduced costs across the Life of Mine (LOM)**
- **Improved weighted average product margin by 34% to \$450/tonne of product**

The commercial strategy review confirmed The Great White Project's kaolin core product portfolio, Great White CRM™ and Great White KCM™ 90, and identified a value in use for that is above market in established and growing segments for high quality ceramic tiles and porcelain tableware.

Andromeda's complementary product portfolio was defined as Great White HRM™ and industrial sand co-products. In addition to the current established use of Great White HRM™ as a rheology modifier, the global market for low-carbon concrete production has been identified as a further opportunity to be commercialised. Industrial sand co-products (not commercialised in the 2022 DFS) will be sold to meet the regional shortfall in the construction and infrastructure markets.

Subject to additional funding, the commercial strategy review identified an opportunity for High Purity Alumina (**HPA**) to become part of Andromeda's complementary product portfolio. Technical and market validation is proposed to restart, post The Project's commissioning. It is estimated \$8-10 million will be required to complete a prefeasibility study on HPA, the commercialisation of which is not included in the 2023 DFS.

Andromeda is focused on the sustainable development of its future operations, through a low-impact approach to mining and processing over the life of The Great White Project, and effective, ongoing, and transparent consultation across all our stakeholders, including First Nations and the local community.

For Stage 1A, it is estimated that the Scope 1 & 2 emissions (mine to gate) will be 0.097 t CO<sub>2</sub>-e per tonne of product<sup>2</sup>, equating to kilogram per revenue figures of 0.17 per Australian dollar and 0.29 per Euro at full production. Scope 3 emissions (gate delivered to port) are estimated to be 0.184 t CO<sub>2</sub>-e/t, with Andromeda intending to reduce its operational carbon footprint as production expands.

<sup>1</sup> All monetary values in this document are expressed in Australian dollars

<sup>2</sup> t CO<sub>2</sub>-e/t refers to tonnes of equivalent carbon dioxide per tonne of product.



**Bob Katsioularis, CEO and Managing Director of Andromeda said:** "The 2023 DFS represents the outcome of a rigorous commercial and business strategy review for commercialising our construction ready project, to meet rising market demand.

As we move to finalising debt funding, the 2023 DFS will underpin our funding strategy for the remaining capital required to move towards anticipated construction and into production."

## 2023 DFS compared to the 2022 DFS

Comparison of key metrics from the 2023 DFS to the 2022 DFS are presented in Table 1 below.

**Table 1 Key Metrics Comparison (pre-tax)**

2022 DFS		2023 DFS
\$613 million	<b>NPV<sub>a</sub><sup>3</sup></b> <b>+65%</b>	<b>\$1,010 million</b>
\$4,706	<b>Revenue</b> <b>+32%</b>	<b>\$6,207 million</b>
300,000 tpa	<b>Kaolin Production Target<sup>4</sup></b> <b>0%</b>	<b>300,000 tpa</b>
15.1Mt	<b>Ore Reserve<sup>5</sup></b> <b>0%</b>	<b>15.1 Mt</b>
28 years	<b>LOM</b> <b>0%</b>	<b>28 years</b>
\$337 / tonne	<b>Weighted Average Product Margin<sup>6</sup></b> <b>+34%</b>	<b>\$450 / tonne</b>
\$82 million	<b>Average Annual EBITDA</b> <b>+59%</b>	<b>\$130 million</b>
\$207 million	<b>Capital Costs<sup>7</sup></b> <b>-9%</b>	<b>\$188 million<sup>8</sup></b>
\$26 million	<b>Sustaining Capital</b> <b>+36%</b>	<b>\$35 million</b>
36%	<b>IRR</b> <b>+9%</b>	<b>45%</b>
5.9 years	<b>Payback Period<sup>9</sup></b> <b>-14%</b>	<b>5.1 years</b>

<sup>3</sup> All dollar values are undiscounted other than NPV<sub>a</sub>

<sup>4</sup> Kaolin final production volume as measured in tonnes per annum (tpa) and excludes sales of industrial sand. The staged ramp-up as follows:

2023 DFS	Stage 1A – 50,000 tpa	Stage 1B – 150,000 tpa	Stage 2 – 250,000 tpa	Stage 3 – 300,000 tpa
2022 DFS	Stage 1 – 150,000 tpa	Stage 2 – 150,000 tpa	Stage 3 – 300,000 tpa	Stage 4 – 300,000 tpa

<sup>5</sup> JORC compliant Ore Reserve remains as lodged in ADN ASX announcement dated 6 April 2022 titled *Great White Kaolin Project - Definitive Feasibility Study and Updated Ore Reserve*.

<sup>6</sup> Includes incremental revenue from sales of Industrial Sand as a co-product in the calculation

<sup>7</sup> Capital costs for each stage of production are as follows:

2023 DFS	Stage 1A – \$62.4m	Stage 1B – \$57.6m	Stage 2 – \$57.2m	Stage 3 – \$10.9m
2022 DFS	Stage 1 – \$93.8m	Stage 2 – \$11.0m	Stage 3 – \$73.8m	Stage 4 – \$28.3m

<sup>8</sup> Capital costs of \$3.1 million have been incurred since the 2022 DFS for capital items (long lead items) and land related payments. In addition, capital costs in 2023 DFS have been impacted by favourable product mix.

<sup>9</sup> Payback period includes capital costs of Stages 1A, 1B and 2. Capital costs of Stage 3 intended to be funded by cash flows from The Project.



## Tax treatment

- Andromeda continues to report on a pre-tax basis, given it has \$191 million in available tax losses to June 2022, reducing taxes payable on any future profits, subject to the normal tax rules to carry forward losses.

## 2023 DFS Highlights

### Strengthened global prices driven by geopolitical risk and global and regional supply shortages

- The significant and growing market gap for high quality kaolin has greatly increased by the recent loss of Ukrainian kaolin, which was recognised as a world leader in quality for use in ceramic applications.
- Ukraine, up until 2022, was consistently recorded in the top 10 kaolin exporters, with over 1 million tonnes of kaolin exported in 2021.<sup>10</sup>
- There are currently no announced new high quality kaolin projects (>36.5% Al<sub>2</sub>O<sub>3</sub>) globally.

### Enhanced product mix and partner portfolio

- Rigorous market and technical validation coupled with a disciplined and optimised mine response identified the core, complementary and adjacent product portfolios.
- The exclusion of Great White PRM™ (included in the 2022 DFS) has led to enhanced product portfolio margins.
- Andromeda's selected strategic partners helped develop value in use and market penetration of the product portfolio.
- 2023 DFS product portfolio mix is less capital intensive than the 2022 DFS.

### Established high value in use of Andromeda products in key market segments

- Great White CRM™ and Great White KCM™90 world class brightness, colour and aluminium to iron ratio was confirmed independently by ITC and IberoClays.<sup>11</sup>
- Globally, Andromeda estimates an identified contestable market for high quality ceramic tiles of 340 – 500 ktpa<sup>12</sup>.
- There is a shortage of good quality construction sand across Australia, as reported by market followers.

### An updated mine development plan supports an accelerated sales profile and reduced costs across Life of Mine (LOM)

- The new starter pit position (see Figure 1) and the first 36 months of the mine plan represent an ideal mine response to the market to mine plan, identified through the commercial strategy review.
- Excluding Great White PRM™ from the 2023 DFS contributed to a margin uplift.
- Improved sequencing of overburden removal reduced cost.
- Cost avoidance and additional sales will be realised by commercialising both coarse and fine industrial sand co-products.
- The 2023 DFS has the following product portfolio, by volume:
 

24.9%	Great White CRM™ <sub>P</sub>	5.4%	Great White HRM™	42.4%	Industrial sand
25.1%	Great White CRM™ <sub>T</sub>	2.2%	Great White KCM™		

### Weighted average product margin improved by 34% to \$450/tonne of product<sup>13</sup>

- Product pricing has been determined based on existing offtake agreements<sup>14</sup>, market and technical product validation by independent consultants, customer product validation, market research and market forecast data from TZ Minerals International Pty Ltd (TZMI).
- Pricing for Great White HRM™ is included at conservative levels due to ongoing customer validation work.

<sup>10</sup> Kaolin Market, Market Analysis 2018-2030 (Grand View Research, 2023).

<sup>11</sup> Testwork was carried out by IberoClays and the Instituto de Tecnologia Ceramica in 2023.

<sup>12</sup> Work commissioned by Andromeda, "overview of the Ceramic tile market" (Strateg-on, 2023).

<sup>13</sup> Great White HRM™ is included at conservative prices due to ongoing customer validation.

<sup>14</sup> Including long form offtake agreements and terms sheets.



## Decarbonisation opportunities in construction materials increasingly mandated by new regulations, support the product portfolio

- Working with partners to validate Great White HRM™ applications and value in use across markets, prior to commercialisation and distribution.
- A significant amount of work has been undertaken to understand and utilise the un-calcined attributes of Great White HRM™.
- The rheology modification properties of Great White HRM™ reduce the amount of cement required in concrete production, potentially reducing global carbon emissions by over 7%.<sup>15</sup>

## Planned Development Pathway

The 2023 DFS confirms the staged approach (Figure 1) to the development of The Great White Project results in low initial capital requirements and a 12-month construction and commissioning program required for each stage.



Figure 1 2023 DFS planned development stages

## The Great White Project Product Geology Heat Map: Mine to Market Response

The Great White Project Reserve (Table 2) has remained unchanged since the 2022 DFS.

Table 2 The Great White Project Reserve

Reserve Category	Mt	Yield (%)	Halloysite (%)	Brightness (%)	Fe <sub>2</sub> O <sub>3</sub> (%)
Proved	5.2	45	14	84	0.5
Probable	10	46	10	83	0.5
<b>Total</b>	<b>15.1</b>	<b>46</b>	<b>11</b>	<b>84</b>	<b>0.5</b>

The Great White Deposit's 15.1 Mt JORC reserve delineated by core and complementary products aligned to market demand, is presented in Figure 2.

<sup>15</sup> Work commissioned by Andromeda, "Product Evaluation of Great White Halloysite Kaolin Clay (Great White HRM) for Andromeda Metals Pty Ltd" (Jackson, 2023).

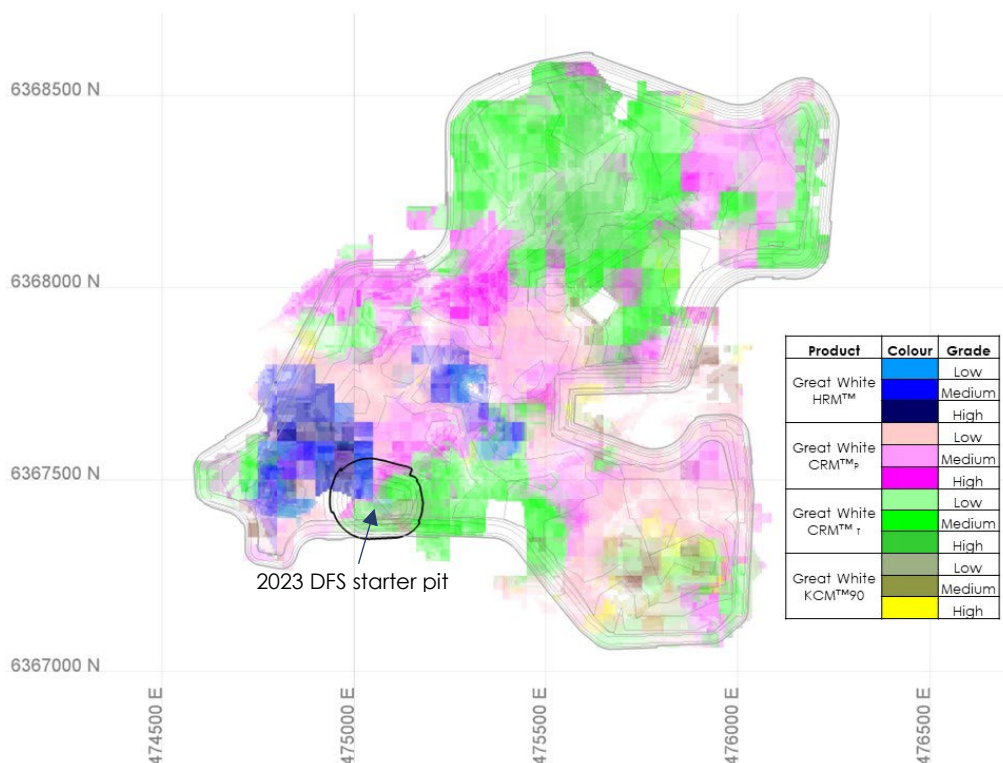


Figure 2 The Great White Project 2023 DFS starter pit position, products<sup>16</sup>, and grades

## Andromeda Product Development Comparison Table

Core, complementary and adjacent products will go through a product lifecycle assessment (Table 3) as part of the commercialisation process. This is outlined in detail in 2023 DFS Executive Summary under Andromeda's Commercial Strategy Map (refer to Executive Summary Section 1.4).

Table 3 Andromeda Product Development Comparison Table

Market and Technical Validation Element	Great White CRM™	Great White KCM™ <sub>90</sub>	Great White HRM™	Industrial Sand	HPA
Determine key market segments	✓	✓	✓	✓	✓
Conduct initial process testwork	✓	✓	✓	✓	✓
Conduct initial product testwork	✓	✓	✓	✓	Planned
Identify addressable market	✓	✓	✓	✓	✓
Value in use assessment	In progress	In progress	In progress	n/a	Planned
Identify contestable market share	✓	✓	Planned	Planned	Planned
Conduct commercial scale pilot trials	In progress	In progress	Planned	Planned	Planned

### Assumptions and Notes:

- The 2023 DFS financial model methodology has been verified by independent financial consultant.
- A discount rate of 8% has been used.
- A revised foreign exchange rate of AUD:USD 0.675 (2022 DFS 0.74) has been applied.
- Product pricing is commercially sensitive and legally restricted, and has not been disclosed in this document.
- The Great White Project results in Table 1 of this document are based on the same Ore Reserve reported with the 2022 DFS<sup>17</sup>. The Ore Reserve estimate supporting the production targets and in turn the forecast financial information based on those targets, has been prepared by a Competent Person in accordance with the JORC

<sup>16</sup> Great White CRM™<sub>T</sub> is for use in high-quality ceramic tiles and Great White CRM™<sub>P</sub> is for use in high-quality ceramic porcelain tableware.

<sup>17</sup> The material assumptions underpinning the Ore Reserve estimate published in April 2022 continue to apply and have not materially changed. Refer to ASX announcement 6 April 2022 'Great White Kaolin Project – Definitive Feasibility Study'.



Code requirements. Accompanying Competent Persons consent statements for this document applicable to the JORC 2012 Code for the publication of the Ore Reserve estimate are included at the end of this Announcement.

- The Ore Reserve estimate classified as being Proven has been derived from the Mineral Resource classified as Measured only. The Ore Reserve estimate classified as being Probable has been derived from the Mineral Resource classified as Indicated only. The Ore Reserve comprises of 34% Proved Reserve and 66% Probable Reserve (Table 2)<sup>18</sup>. The Production Target comprises of 34% Proved Reserve, 65% Probable Reserve and 1% Inferred Resources. Inferred Resources are not included in the Reserve and are not considered within the pit design process. There is a low level of geological confidence associated with Inferred Mineral Resources and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources of that production target itself will be realised.
- Metallurgical test work has been completed by reputable laboratories experienced in kaolin processing. This testwork supports modifying factors applied in the Ore Reserve estimate.
- The mining process has been based on Measured and Indicated Mineral Resources reported in accordance with the 2012 JORC code, together with mine designs and scheduling, geotechnical parameters and mining equipment determined from experienced mining engineers.
- The processing plant design has been developed by Andromeda personnel with experienced process engineers to support the flowsheet and the predicted yield, throughput, and production estimates of The Project.
- The infrastructure requirements have been defined by specialist engineers in conjunction with The Project Team.
- The detailed designs discussed in the 2023 DFS have been used as the basis for capital and operating costs estimates which have been corroborated by suppliers, contractor and vendor quotes.
- A Corporate tax rate of 30% has been assumed.
- The new mine royalty rate of 2.00% will apply until 30 June 2026 and then increase to 3.5% thereafter.
- Corporate costs of \$1m per annum have been allowed for in respect of charges for centralised services and resources that may be utilised, such as accounts payable, legal, marketing and project management.
- No allowance has been made for the following items in the operating cost estimate:
  - Exchange rate variations
  - Escalation
  - Project financing costs
  - Interest charges
- All goods and services tax (GST), import duties, surcharges and any other statutory taxation, levies or government duties are excluded.
- No allowance for contingency has been made in the operating cost estimates.
- The mining method will be conventional earth moving.
- The processing method will be blunging, separation, dewatering, product drying and packaging.
- The Company will receive all authorisations required to sell industrial sand and increase processing of kaolin ore beyond 300,000 tonnes per annum.
- The average annual processing rate will be ~93,000 tpa (17 months), ~298,000 tpa (2 years) ~504,000 for 2 years and 612,000 tpa (21.5 years).
- Average annual saleable production 45,000 tpa (17 months), 142,000 tpa (2 years), 250,000 tpa (2 years) 297,000 (21.5 years).
- Mine life is 28 years.
- Accuracy of data is to +/-15%.

*This ASX announcement has been approved for release by the Board of Directors of Andromeda Metals Limited.*

For more information about the Company and its projects, please visit our website, [www.andromet.com.au](http://www.andromet.com.au) or contact:

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<sup>18</sup> The material assumptions underpinning the Ore Reserve estimate published in April 2022 continue to apply and have not materially changed, Refer to ASX announcement 6 April 2022 'Great White Kaolin Project – Definitive Feasibility Study'.





## Disclaimer and qualifications

This DFS was prepared for the sole and exclusive benefit of Andromeda. Any other use or reliance on this DFS by any third party is at that party's sole risk.

This DFS is meant to be read as a whole. Sections should not be read or relied upon out of context.

This DFS contains the expression of professional opinion based on information available at the time of preparation. The quality of the information, conclusions and estimates contained in this DFS are consistent with the intended level of accuracy, and are subject to the assumptions, qualifications and disclaimers described in this DFS. Information in this DFS may be subject to change without notice.

## Forward-looking statements

This DFS contains or may contain certain forward-looking statements and comments about future events, that are based on Andromeda's beliefs, assumptions and expectations and on information currently available to management as at the date of this DFS. Often, but not always, forward-looking statements can generally be identified by the use of forward-looking words such as "may", "will", "expect", "plan", "believes", "estimate", "anticipate", "outlook", and "guidance", or similar expressions, and may include, without limitation, statements regarding plans, strategies and objectives of management, anticipated production and production potential, financial forecasts, product quality estimates of future Mineral Resources and Ore Reserves.

Such statements are only expectations or beliefs and are subject to inherent risks and uncertainties which could cause actual values, results or performance achievements to differ materially from those expressed or implied in this DFS.

Where Andromeda expresses or implies an expectation or belief as to future events or results, such expectation or belief is expressed in good faith and on a reasonable basis. No representation or warranty, express or implied, is made by Andromeda that the matters stated in this DFS will in fact be achieved or prove to be correct. Except as required by law, Andromeda undertakes no obligation to provide any additional or updated information or update any forward-looking statements whether on a result of new information, future events, results or otherwise.

Readers are cautioned against placing undue reliance on forward-looking statements. These forward-looking statements are not guarantees of future performance and involve known and unknown risks, uncertainties, assumptions and other important factors, many of which are beyond the control of Andromeda, the directors, and management of Andromeda. These factors include, but are not limited to difficulties in forecasting expected production quantities, the potential that any of Andromeda's projects may experience technical, geological, metallurgical and mechanical problems, changes in market prices and other risks not anticipated by Andromeda, changes in exchange rate assumptions, changes in product pricing assumptions, major changes in mine plans and/or resources, changes in equipment life or capability, emergence of previously underestimated technical challenges, increased costs, and demand for production inputs.

## Accuracy

This DFS has been prepared to an overall level of accuracy of approximately +/-15%, guided by the requirements of the Australian Institute of Mining and Metallurgy (AusIMM) guidelines (AusIMM 2012. Cost Estimation Handbook Second Edition, Monograph 27).

## Currency

Unless otherwise stated, all cashflows in this DFS are in Australian dollars, are undiscounted and are in real terms (not subject to inflation/escalation factors).

## No warranty

While care has been taken in preparing the information in this DFS, no representation or warranty, express or implied, is made as to the currency, accuracy, reliability, completeness or fairness of the information, opinions and conclusions contained in this DFS. The information in this DFS has been obtained from or based on sources believed by Andromeda to be reliable. This includes references to test results and reports completed by external parties.

Information in this DFS which is attributed to, or derived from, a third-party source has not been independently checked or verified by Andromeda. No representation or warranty is made as to the accuracy, completeness or reliability of such information.

To the maximum extent permitted by law, neither Andromeda nor its related corporations, Directors, officers, employees, advisers or agents, nor any other person, accepts any liability, including, without limitation, any liability arising from the use of this DFS or its contents or otherwise arising in connection with it, nor guarantees or makes any representations or warranties, express or implied, as to or takes responsibility for, the currency, accuracy, reliability, completeness or fairness of this DFS nor the information, opinions and conclusions contained in this DFS.

## Third party data from consultants and government agencies

Andromeda has relied on information provided by specialist consultants and government agencies in preparing this DFS. Andromeda has reviewed all information to the best of its ability but does not take responsibility for its accuracy or completeness, or reliability of such information.

## Third party data on markets and pricing

This study uses information from third parties pertaining to the kaolin industry, forecast pricing, market segments and end-markets in which Andromeda intends to operate (Market Data). This information has been substantially derived from market research prepared by third parties.

The Market Data includes assumptions, estimates and generalisations that the Company believes to be reliable, but no representation or warranty is made as to the accuracy, completeness or reliability of such information. Due to the forward looking nature of the Market Data, it may not necessarily reflect actual market conditions and there is no guarantee that any forward looking statements in the Market Data will prove to be correct or will be achieved.

Andromeda has not independently verified the Market Data and the Company cannot give any assurances to the accuracy or completeness of this information or the underlying assumptions used in generating this information. Industry assumptions, forecasts and estimates involve risks and uncertainties and are subject to change based on various factors, including those discussed in the risk factors set out in Executive Summary Section 15.



## Additional authorisations/certification

Additional authorisations or certification is required for certain activities described in this study, including:

- a. the current Program for Environment Protection and Rehabilitation (PEPR) covers a 13 year mine life, with processing of 300,000 tonnes per annum of kaolin ore, so any increase or change to this will require a new PEPR;
- b. the sale of sand products as extractive minerals, which is not currently authorised under Mining Lease 6532 (and will require a change in operations) or under the PEPR (which would need to be updated and approved by DEM accordingly)
- c. the sale of Great White HRM™ into Europe, which will require certification.

Andromeda has no reason to believe that such additional authorisations and certifications will not be forthcoming, but no guarantee can be given on this, including as to timing.

### No investment or financial product advice

The information contained in this DFS does not constitute investment advice or financial product advice (nor taxation or legal advice) and is not intended to be used as the basis for making an investment decision or as a recommendation to acquire securities in Andromeda.

The information contained in this DFS should not be relied upon as a recommendation or forecast by Andromeda (including as to the performance of Andromeda or its share price). Readers should obtain their own professional advice and carry out their own independent investigations and assessment of the information in this DFS (including any assumptions) before acting.

An investment in Andromeda is subject to investment and other known and unknown risks, some of which are beyond the control of Andromeda including loss of income and principal invested.

This DFS has been prepared without taking into account any particular person's objectives, financial situation or needs; does not purport to identify the nature of specific market or other risks associated with any investment in the Company and does not constitute any legal, taxation, investment or accounting advice.

An investment in Andromeda's securities is subject to investment and other known and unknown risks, some of which are beyond the control of Andromeda including loss of income and principal invested. Any investment decision should be based only on a person's own due diligence, inquiry, assessment and professional advice.

Readers should have regard to Executive Summary Section 15 of this study for further information about risks applicable to Andromeda.

## Mineral Resources and Ore Reserves Estimates

As an Australian company with securities listed on the Australian Securities Exchange (ASX), Andromeda is subject to Australian disclosure requirements and standards, including the requirements of the Corporations Act and the ASX. Investors should note that it is a requirement of the ASX listing rules that the reporting of ore reserves and mineral resources in Australia comply with the 2012 edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the JORC Code) and that the Ore Reserve and Mineral Resource estimates underpinning the production targets in this DFS have been prepared by a Competent Person in accordance with the JORC Code.

Information that relates to Mineral Resource Estimate has been previously announced to ASX on 26 November 2020, "Updated Mineral Resource for the Great White Kaolin Project" and, information that relates to Ore Reserve Estimate has been previously announced to ASX on 6 April 2022, "Great White Kaolin Project – Definitive Feasibility Study and Updated Ore Reserve" both available at <https://www2.asx.com.au/markets/company/adn>. Andromeda confirms that it is not aware of any new information or data that materially affects the information included in the original market announcement and that all material assumptions and technical parameters underpinning the estimates continue to apply and have not materially changed.

### Modifying Factors

Modifying factors under the JORC Code (mining, processing, transport and shipping, refining, marketing, infrastructure, environment, legal, social and commercial) have been considered in this DFS and the Ore Reserve estimation.

### Competent Person's Statements

The data in this report that relates to Mineral Resource estimates for The Great White Deposit is based on information evaluated by Mr Eric Whittaker who is a Member of the Australasian Institute of Mining and Metallurgy (MAusIMM). Mr Whittaker is the Chief Geologist of Andromeda Metals Limited and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"). Mr Whittaker has over 30 years of experience in the mining industry. Mr Whittaker consents to the information in the form and context in which it appears. Mr Whittaker is entitled to participate in Andromeda's employee incentive plan.

The data in this report that relates to Mineral Reserve estimates for The Great White Deposit is based on information evaluated by Mr John Millbank who is a Member of the Australasian Institute of Mining and Metallurgy (MAusIMM). Mr Millbank is the Director of Proactive Mining Solutions Pty Ltd, an independent mining consultancy, and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration, and to the activity which he is undertaking, to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"). Mr Millbank consents to the information contained in this report being used in the form and context in which it appears. Mr Millbank, or any of the entities he directly controls, has no financial interests in Andromeda Metals Ltd or any of its subsidiaries.

### Photographs, Diagrams and charts

Diagrams and maps used in this DFS are illustrative only and may not be drawn to scale.

Unless otherwise stated, all data contained in the charts, graphs and tables is based on information available at the date of this DFS.





## Appendix: The Great White Project 2023 Definitive Feasibility Study

### 1 Overview

Andromeda Metals Limited (**ASX: ADN**) (**Andromeda, the Company**) is pleased to release the results of an updated Definitive Feasibility Study (**2023 DFS**) following a comprehensive commercial strategy review and approach to developing the world-class, high quality Great White Deposit. The Great White Project (**TGWP, The Project**) is construction ready with the required permits in place.

When compared with the Definitive Feasibility Study released in April 2022 (**2022 DFS**), The Project Net Present Value (**NPV**) increases by 65% to \$1,010 million, with average annual earnings before interest, taxes, depreciation and amortisation (**EBITDA**) of \$130 million.

The increased NPV compared to the 2022 DFS, primarily results from:

- Strengthened global prices driven by geopolitical risk and global and regional supply shortages
- Enhanced product mix and partner portfolio
- Established high value in use of Andromeda products in key contestable market segments
- An updated mine development plan (based on the Mine to Market response) that supports an accelerated sales profile and reduced costs across the Life of Mine (**LOM**)
- Improved weighted average product margin by 34% to \$450/tonne of product.

The commercial strategy review confirmed The Great White Project's kaolin core product portfolio, Great White CRM™ and Great White KCM™ 90, and identified a value in use that is above market in established and growing segments for high quality ceramic tiles and porcelain tableware.

Andromeda's complementary product portfolio was defined as Great White HRM™ and industrial sand co-products. In addition to the current established use of Great White HRM™ as a rheology modifier, the global market for low-carbon concrete production has been identified as a further opportunity to be commercialised. Industrial sand co-products (not commercialised in the 2022 DFS) will be sold to meet the regional shortfall in the construction and infrastructure markets.

With the work undertaken in the 2023 DFS, The Project is positioned to produce the abovementioned three high quality kaolin products and industrial sand co-product for sale domestically and overseas.

The high quality, consistency and large tonnage of The Project provides for a long-term operation, offering generational employment opportunities for the local area and the surrounding districts with opportunities to diversify and grow their economies.

The Project is proposed in four production stages (see section 8).

Key risks have been identified and mitigated as far as practicable.

The Project has been costed, scheduled and is construction ready. With an approved Mining Lease (**ML**) 6532 and associated miscellaneous purpose licences (**MPL**) approved. The Project's Program for Environment Protection and Rehabilitation (**PEPR**) is approved. Long lead time items have been ordered and key members of the Owner's team recruited.

Andromeda has entered into settlement deeds with the land owners to acquire the freehold land underlying ML 6532 and MPL 164, subject to subdivision and boundary realignment of the land, with Andromeda permitted to access the land prior to settlement for preparatory



works, mine construction and mining activities<sup>1</sup>. Native title has been extinguished in respect of this freehold land.

The 2023 DFS was prepared by Andromeda, with input from a range of independent, experienced specialist consultants to ensure the 2023 DFS was completed to a high standard (see section 17).

## 1.1 Key Financial Metrics – 2022 DFS vs 2023 DFS

Comparison of key metrics from the 2023 DFS to the 2022 DFS presented in Figure 1-1 and Figure 1-2.

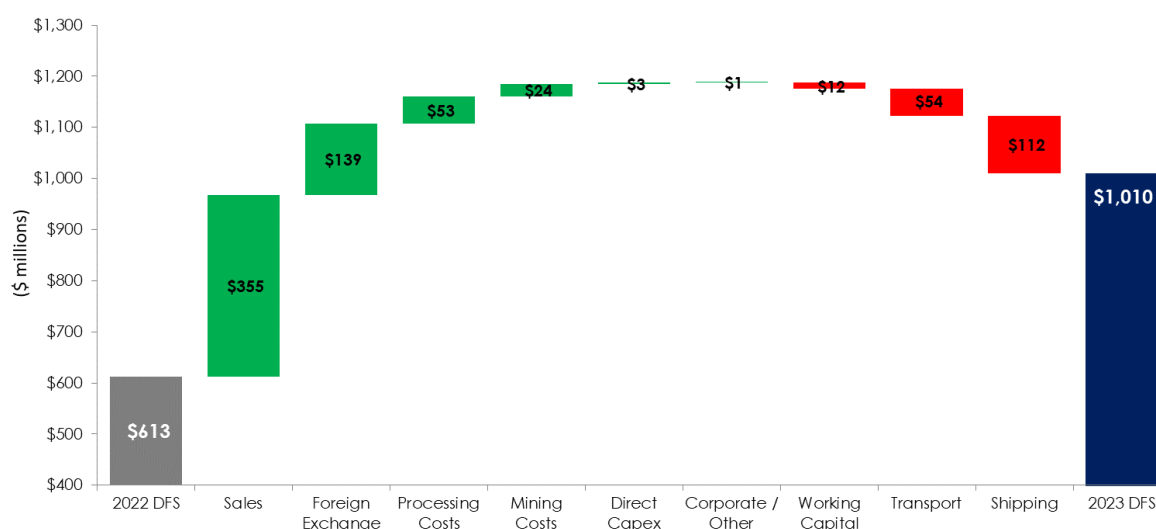


Figure 1-1 2023 DFS vs. 2022 DFS - Net Present Value (millions)

The NPV of The Project has increased by 65% from \$613 million in the 2022 DFS to \$1,010 million. The increase in NPV was driven by:

- \$355 million from a 28% increase in product sales revenue as a result of an enhanced and broadened product mix, with an increase in Great White HRM™ production volumes and the addition of sales from industrial sand;
- \$139 million as a result of an improved exchange rate of AUD:USD of 0.675 (2022 DFS 0.74) for sales in USD;
- \$53 million from a 20% reduction in processing costs;
- Offset by reductions due to:
  - \$112 million from increased shipping costs as a result of move to use containerised shipments for freight delivery; and
  - \$54 million due to smaller product parcel sizes of 5,000 tonnes from the 10,000 tonnes per parcel in the 2022 DFS.

<sup>1</sup> Refer ASX announcement 18 August 2022 'Andromeda progresses Great White Kaolin Project with signing of Land Acquisition Agreements and lodgement of PEPR'

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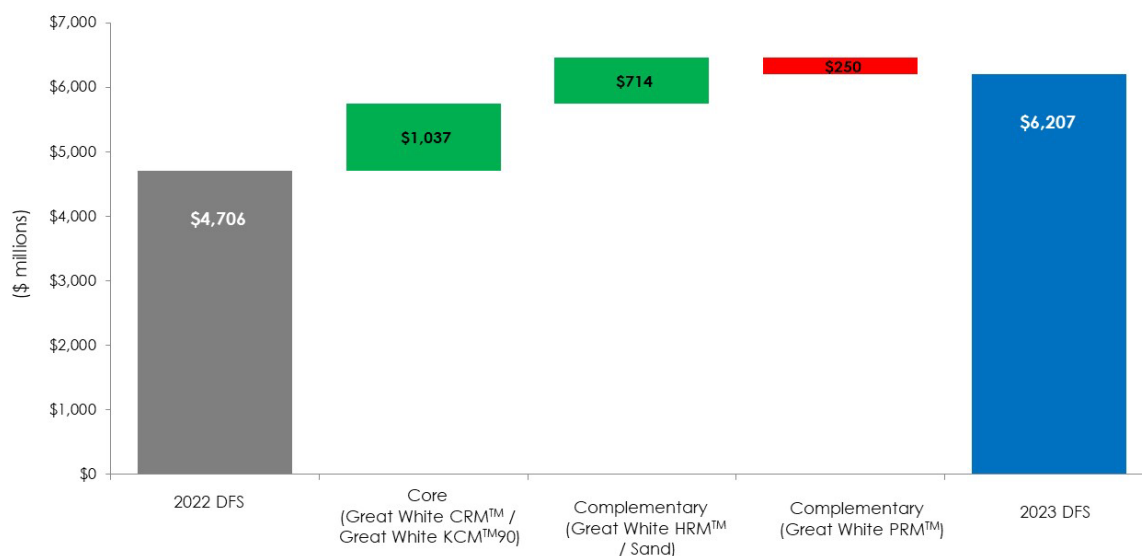


Figure 1-2 2023 DFS vs. 2022 DFS - Sales by Product Group (A\$M)

Revenue has increased by 32% from \$4,706 million in the 2022 DFS to \$6,207 million. The increase was driven by:

- \$1,037 million increase from sales of Core products, being Great White CRM™ and Great White KCM™90;
- \$714 million from increased sales for Complementary products due to an increase in Great White HRM™ production volumes and the addition of sales from industrial sand; and
- A \$250 million reduction from the sales of Great White PRM™ previous included in the 2022 DFS, not being included in the 2023 DFS.

## 1.2 Strategic Intent

Andromeda's vision is to be "The Great White Mineral Company", with the ambition to lead the world in the sustainable supply of superior quality industrial minerals. Andromeda is the proud owner of what are believed to be some of the last great white mineral deposits in the world: a unique blend of bright kaolinite and halloysite clays, producing a refined product with a high average alumina content of greater than 36%.

## 1.3 The Great White Project

The Project is located approximately 15 kilometres (**km**) southwest of the township of Poochera in a rural community. Poochera is located on the Eyre Highway about 635 km northwest by road from Adelaide and 65 km east of Streaky Bay, on the Eyre Peninsula in South Australia, see Figure 1-3.



The Project has highly valued kaolinite and halloysite mineral deposits with a world-class iron to alumina ratio<sup>2</sup>, outstanding mechanical strength, exceptional fired brightness, and distinctive rheological properties.

The Andromeda team is passionate about developing, commercialising, and monetising TGWP and, Andromeda's other high-grade kaolin deposits.

Andromeda's 2023 comprehensive commercial strategy review identified a product value in use that was above the existing market value for The Great White Project's kaolin core product portfolio, Great White CRM™ and Great White KCM™ 90, in established and growing markets for high quality ceramic tiles and ceramic porcelain tableware.

Andromeda's complementary product portfolio has been defined as Great White HRM™ and industrial sand co-product. In addition to the identified use of Great White HRM™ as a rheology modifier, the global market for low-carbon concrete production has been identified as a further opportunity. Industrial sand co-product will be sold to meet the regional shortfall in the construction market.

Andromeda's adjacent businesses (high purity alumina (HPA) and carbon capture) are considered still at scoping or pre-scoping stage. As such, they have not been included in this 2023 DFS.

Subject to additional funding, the commercial strategy review identified an opportunity for HPA to become part of Andromeda's complementary product portfolio following technical and market validation. This is proposed to restart post commissioning of The Project.



Figure 1-3 Project regional location map

<sup>2</sup> Refer to section 2.3 for further details

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## 1.4 Commercial Strategy Map

For the 2023 DFS, Andromeda's commercial strategy review identified a product portfolio that balanced a rigorous segmented market to mine approach with a disciplined and optimised mine to market response. Andromeda's commercial strategy map is presented in Figure 1-4.

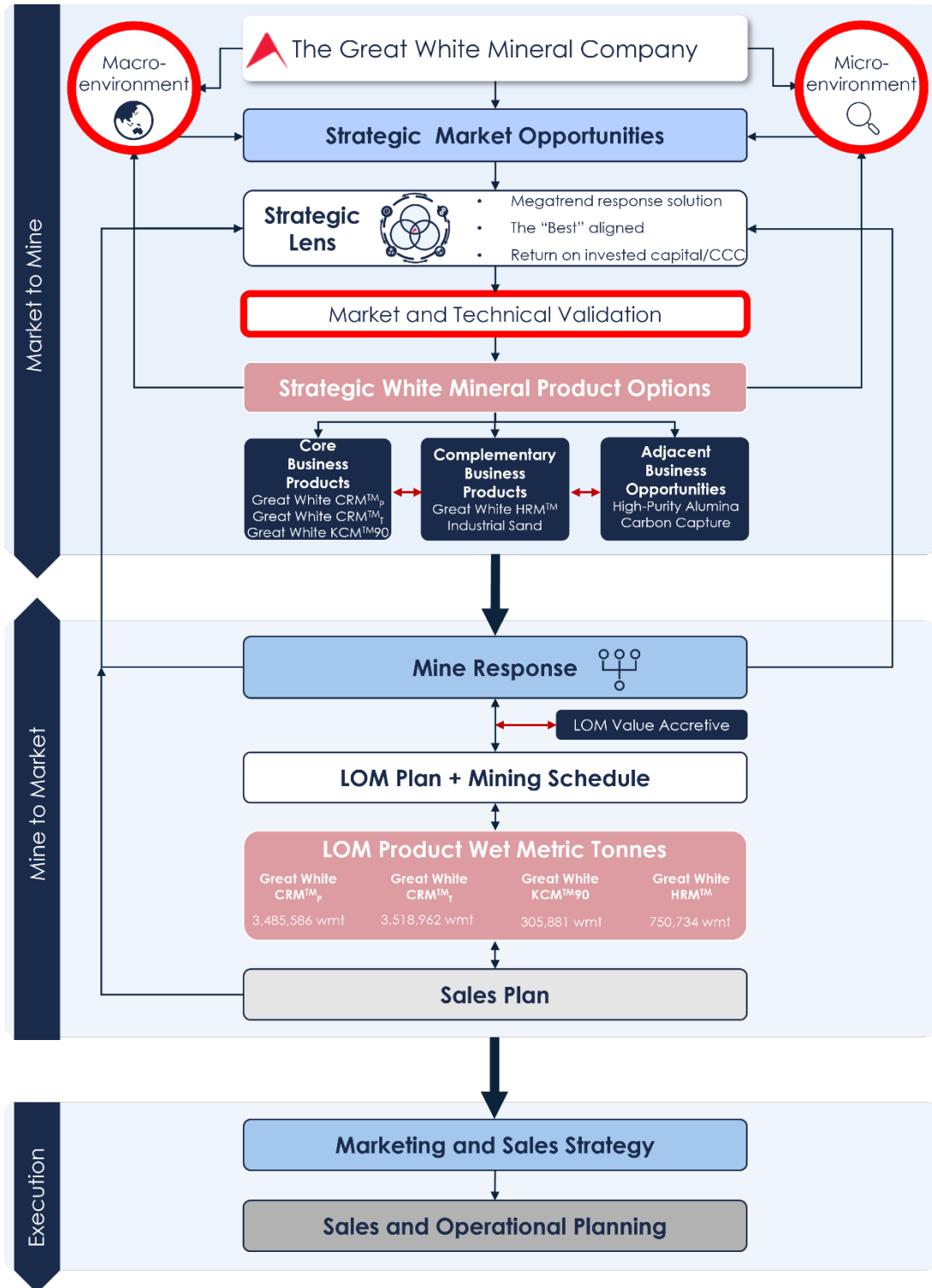


Figure 1-4 Andromeda's Commercial Strategy Map





Andromeda identified and understands the key drivers in the macroenvironment and microenvironment in which it operates. From this understanding, strategic white mineral market opportunities were identified. Through Andromeda's market to mine approach, white mineral options were proposed for those strategic market opportunities with the greatest business potential. Proposed white mineral options were then assessed for strategic fit with Andromeda's strategic lens.

Andromeda's strategic lens is an essential decision-making tool in the market-to-mine stage of the strategic map methodology. This tool was used to identify strategic white mineral product options by determining how best to take advantage of macroenvironment and microenvironment factors and economic trends to ultimately drive value creation.

Identified strategic market opportunities were evaluated against three key strategic criteria:

1. megatrend response solution - based on the need for the white mineral product options to respond to one or more of the following key megatrends: urbanisation, decarbonisation and technology;
2. aligned with the "Best" - white mineral products were assessed against the best in class value in use, this could result in premium pricing in targeted market segments;
3. return on capital investment, cash conversion cycle - a core competency for Andromeda, this determined who to sell to, on what terms and how quickly could cash flow in the business.

Prioritised white mineral options with strategic fit were then evaluated to assess their market and technical viability for value in use within the target market segments. Validated strategic white mineral product options were allocated into either core, complementary or adjacent business products based on the met criteria.

Andromeda then applied its mine to market response by ensuring the products are value accretive for the LOM. The LOM plan and mining schedule was developed, and the product tonnages were determined in response to the market demand. A sales plan was then developed, which matched these product tonnages.

To support implementation of the sales plan, Andromeda developed its marketing and sales strategy. Ongoing sales and operational planning will continue to optimise future profitability.

Andromeda's commercial strategy map and methodology essentially continuously defines:

"Where we want to play, why we want to play there, who we want to play with, and when."

The commercial strategy map and methodology assist in providing direction towards the markets best suited for TGWP products, the underlying drivers for why they are the best suited, and the key customers, stakeholders, partners and competitors anticipated response.

By determining the "where", Andromeda can identify and efficiently capture the value in use potential for both preferred customers and for Andromeda alike. By understanding and actively revisiting the "why", Andromeda will be able to respond and adjust to prevailing market conditions. The "who" will evolve over time as customers, stakeholders, partners and competitors will be driven by different strategic imperatives.

By keeping a disciplined approach across the commercial strategy map and methodology, Andromeda will have the commercial tools in place to understand these changing imperatives in order to prepare and capitalise or mitigate sustainably. More importantly the methodology allows a "first mover" response to leading macro and micro indicators.



## 2 Commercial Strategy Review Outcomes

### 2.1 Strengthened global prices driven by geopolitical risk, and global and regional supply shortages



#### 2.1.1 European Supply and Demand

Data recorded from the British Geological Survey (**BGS**)<sup>3</sup> indicates China is the world's largest producer of kaolin. While China is recognised to have high quality volumes, a significant proportion of total kaolin in China would be considered commodity grade (low quality) kaolin. The European region as a block is reported to be overall 50% larger than China, Andromeda also notes that the quality of this kaolin would be in the range of low through to high quality.

Production (supply) in Europe remained steady around circa 10 million tonnes from 2017 to 2021. Notably, these supply numbers have been reported prior to the onset of war in Ukraine, who were consistently recorded in the top 10 kaolin exporters up until the start of war in 2022.<sup>4</sup> Ukraine exported circa 1.6 million tonnes of kaolin in 2021.<sup>5</sup> Assuming a complete removal of these volumes from the market suggests European supply of circa 8 to 9 million tonnes and which Andromeda particularly believes will place Europe in supply shortfall in the high quality kaolin segment of the market.

On a regional basis, Asia-Pacific is by far the largest consumer of kaolin, with an estimated 54.7% market share in 2021, followed by Europe at 23.1%. At a country level, China dominates, accounting for 24.1% of global demand. The outlook for global demand growth for kaolin between 2020 and 2025 is 4.3% compounded annual growth rate (**CAGR**), adding 7.3 million tonnes to the market over this period (TZMI, 2023).<sup>6</sup>

Spanish and Italian ceramic tile manufacturers which continue to seek sustainable supply sources for ceramic clay, including kaolin – for both tile body and glaze applications. Spain and Italy are therefore a key market for Andromeda, as most of the global formulations are still prepared by these two countries. The supply opportunity is not only for the European operations of these manufacturers, but also for the delivery of product for use in their Asian region operations which is in a clear supply shortfall.

As previously noted, Andromeda sees that in the market for high quality kaolin the options are limited, with the import and export markets key for high quality materials. Andromeda sees these structural and short-term market supply deficits as driving latent demand for product from TGWP.

Note that Andromeda is aware that there are a number of variances in what is reported as kaolin production, supply and demand. There are also variances in the comparative size of the kaolin market segmentation across paper, ceramics, coatings etc. Data from TZ Minerals International Pty Ltd (**TZMI**), Grand View Research, BGS and notably the United States Geological Society (**USGS**) is highly variable due to stockpiling, under reporting of crude kaolin and other differences in estimation and forecasting methodologies. Despite this, it is widely understood that there is a supply gap for kaolin in the long term.

<sup>3</sup> World Mineral Production 2017-2021 (British Geological Survey, 2023)

<sup>4</sup> Kaolin Market, Market Analysis 2018-2030 (Grand View Research, 2023).

<sup>5</sup> Kaolin Market, Market Analysis 2018-2030 (Grand View Research, 2023).

<sup>6</sup> Work commissioned by Andromeda, 'HQ Kaolin Market Study' (TZMI, 2023).



## 2.1.2 Italian and Spanish growth in demand for high quality kaolin

Independent, experienced specialist consultant Galesk Consultancy S.L.U trading as Strategon (**Galesk**) has been commissioned by Andromeda to assist and inform on trends in the ceramics industry.<sup>7</sup> In particular, the leading high quality markets of Spain and Italy. Initial work has shown that both Spain and Italy have a significant reliance on kaolin imports for domestic consumption of kaolin. Of this, kaolin used specifically for ceramics consumption, was a combined average above 50% over 2018 to 2022, with 2022 estimated at circa 66% (Table 2-1).

**Table 2-1 Kaolin markets in Spain and Italy combined<sup>8</sup>**

	000 tonnes kaolin per year				
	2018	2019	2020	2021	2022
<b>Import</b>	734	613	495	611	751
<b>Export</b>	95	76	77	84	90
<b>Domestic production</b>	1,129	715	424	504	480*
<b>Domestic consumption</b>	1,768	1,252	842	1,030	1,140
<b>Ceramics consumption of kaolin</b>	1,137	795	531	650	720

\*estimate

Based on Manufacturing Economic Studies (**MECS**) data, a combined CAGR of 1% is forecast for the combined Spanish and Italian growth of kaolin demand over the next few years.<sup>9</sup> Given the heavy reliance on imports, particularly in the high quality segment of the market, Andromeda has been informed in discussions that high quality ceramic tile producers are increasingly using blends of kaolin in order to de-risk formulations used in high quality ceramic tile production.

## 2.1.3 Urbanisation and Consumer Preferences

Almost two-thirds of the world's population is expected to reside in cities by 2030<sup>10</sup>, with urbanisation creating significant opportunities for social and economic development opportunities, whilst also increasing the demand for the consumption of raw materials including kaolin. The consequences of an increase in urbanisation will see growth driven by the emerging and developing world, with large-scale urban infrastructure needs and a strong uplift in construction material resource requirements.

Urbanisation in countries such as China and India, is expected to continue to bolster the growth and demand for kaolin. Over the next decade the number of upper-middle income and above households in China is expected to grow by almost 70%.<sup>11</sup> Grand View Research was also commissioned by Andromeda to assess the global kaolin market. Their report notes positive economic and social trends, including a rise in consumer spending power, which is seen as having driven construction activities across various economies worldwide. This has also contributed to the growing demand for kaolin-based products.<sup>12</sup>

<sup>7</sup> Work commissioned by Andromeda, 'Overview of the Ceramic tile market' (Galesk, 2023).

<sup>8</sup> Work commissioned by Andromeda, 'Overview of the Ceramic tile market' (Galesk, 2023).

<sup>9</sup> 'World Production and Consumption of Ceramic Tiles' (MECS, 2022).

<sup>10</sup> 'Future Stat 2030: the global megatrends shaping governments' (KPMG, 2014).

<sup>11</sup> McKinsey Global Institute Analysis, 2021.

<sup>12</sup> Grand View Report – Kaolin market, 2018-2030.



### 2.1.4 Industrial Sand Supply Shortage

Housing start statistics globally have seen a recovery post the COVID-19 pandemic and are on the path to recovering to pre-covid levels, with Australia, China and Singapore all yielding predicted forecasted growth. While recent downward growth trends in housing starts have been seen in markets of interest, long term growth forecasts remain. Long term growth in urbanisation is predicted to be one of the key factors contributing to the long-term demand growth for industrial sand.

Of specific note, increased Singapore housing starts and construction is leading to a regional short-fall of industrial sand supply.<sup>13</sup> Singapore imports all its sand, as it has no source of its own. Countries in the Asia-Pacific region, including Australia and Indonesia, have banned/limited or propose to ban/limit sand mining. This will exacerbate the shortfall of industrial sand in the region.

## 2.2 Enhanced product Mix and Partner Portfolio



### 2.2.1 Identifying the Product Portfolio

Andromeda has comprehensively reviewed its commercial strategy to ensure the product portfolio is market driven and meets the Company's strategic criteria. The opportunities that met the strategic criteria underwent a rigorous market and technical validation prior to being organised into Andromeda's core, complementary and adjacent product portfolio. This 2023 DFS defines its optimised portfolio based on the reasons listed in Figure 2-1:

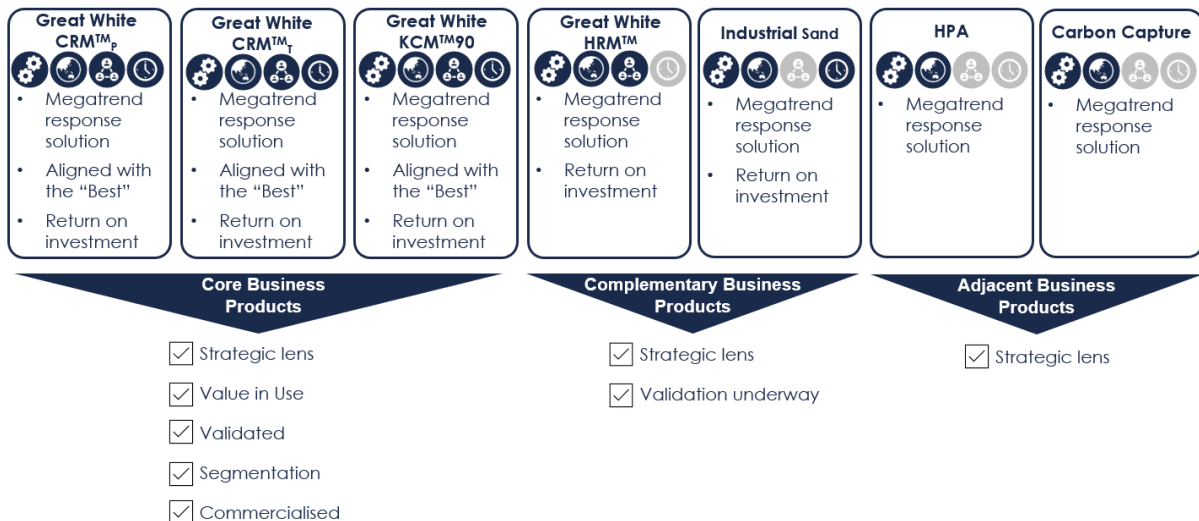


Figure 2-1 Andromeda's Product Portfolio

<sup>13</sup> Singapore housing starts in Singapore – various government and publicly available data, accessed August 2023

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Table 2-2 Products and End-Uses

Product	Description	End-use
<b>Great White CRM<sup>TM</sup><sub>P</sub></b>	Fully refined and dried kaolin product. High brightness and ultra-fine.	High quality porcelain tableware
<b>Great White CRM<sup>TM</sup><sub>T</sub></b>	Fully refined and dried kaolin product. High brightness, ultra-fine and high alumina.	High quality ceramic tiles
<b>Great White KCM<sup>TM</sup><sub>90</sub></b>	Refined, bright white kaolin product.	Ceramics and it can also be used for further refinement by other parties to give a premium grade product for other industry applications. It can be directly added into lower grade resources to increase the total value of the resultant combined product.
<b>Great White HRM<sup>TM</sup></b>	Highly reactive halloysite-kaolin rheology modifier	High solids slurries including concrete and a large range of associated applications where its suspension properties are very effective.
<b>Industrial Sand</b>	There two potential Andromeda sand grades, coarse and fine sand.	Construction market
<b>HPA</b>		Sapphire glass and battery manufacturing
<b>Carbon Capture</b>		Heavy industry carbon producers, who need carbon capture materials

## 2.3 Established high value in use of Andromeda in key markets

Market and Technical Validation

Strategic White Mineral Product Options

### 2.3.1 High quality ceramic tile markets

Andromeda engaged Galesk to identify the contestable market within the high quality ceramic tiles market in Europe<sup>14</sup>. Galesk identified that the contestable market share for the targeted high quality porcelain tiles and large format slabs in Spain and Italy, is estimated at 15% and 25% respectively. The ongoing work being conducted by Galesk also identified that the kaolin products from Andromeda are considered high quality due to its low iron content and high alumina. Galesk identified that the contestable market share for the targeted glazes and bodies in Spain and Italy, is estimated at 29% and 24% respectively.

Andromeda categorises the ceramic tile manufacturers in: Italy and Spain as tier 1; Turkey, the Middle East, Japan and China are categorised as tier 2; and Vietnam, Bangladesh, India, Thailand, Indonesia and Malaysia are categorised as Other.

Together with applying weighting factors based on global export and growth data from MECS<sup>15</sup>, the above mentioned contestable market share estimates from Galesk were used by Andromeda to project contestable markets (Table 2-3).

<sup>14</sup> Work commissioned by Andromeda, 'Overview of the Ceramic tile market' (Galesk, 2023).

<sup>15</sup> 'World Production and Consumption of Ceramic Tiles' (MECS, 2022).

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Table 2-3 Contestable kaolin markets for high quality ceramic tile production, by regions of interest

Ceramic tile producers by tier	000 tonnes kaolin per year	
	Contestable 2021	Contestable 2026
<b>Tier 1*</b>	140	160
<b>Tier 2</b>	110	160
<b>Other</b>	90	180
<b>Total</b>	<b>340</b>	<b>500</b>

\*estimates

The average annual production across the LOM for Great White CRM™<sub>T</sub> represents an indicative 25% share of the contestable 2026 market (126k wmtpa<sup>16</sup>).

Work recently conducted by Galesk indicates base pricing for Andromeda kaolin in Spain (CIF Castellon) and Italy (CIF Ravenna). Further advice from Galesk considers the key drivers uplifting value in use for Andromeda's Great White CRM™/ Great White KCM™90 is as a replacement of zircon as a brightening agent for ceramic tiles. Zircon is notably expensive, so the ability to reduce zircon when using Great White CRM™/ Great White KCM™90 will create value which can be negotiated and shared between customers and Andromeda.

Ongoing value in use work for the high quality ceramic tile market is being conducted across Andromeda's Great White CRM™/ Great White KCM™90 products. Andromeda considers this ongoing work as supportive to future offtake discussions and agreements.

### 2.3.2 High quality ceramic porcelain tableware markets

Andromeda has received advice from both First Test Minerals Ltd and TZMI on the high quality porcelain tableware market and specifically the significant overall market for kaolin in China. This has helped inform Andromeda as to the contestable market for high quality porcelain tableware in China and subsequently in Japan and other global markets of interest.

The advice from First Test Minerals indicated kaolin usage by leading tableware manufacturers in Asia outside of China. Further work is being conducted by Andromeda to obtain ongoing and updated visibility over the global markets for high quality porcelain tableware. Andromeda considers the markets of China and Japan as Priority 1 distributors for kaolin for use in high quality porcelain tableware.

Based on the advice from First Test Minerals, TZMI and discussions with interested distributors, Andromeda has made some estimates of contestable markets for kaolin for use in high quality porcelain tableware. Together with applying weighting factors based on data from First Test Minerals and TZMI, these contestable estimates were further used by Andromeda to compile some initial projections for the other countries of interest outside of China and Japan as shown in Table 2-4.

<sup>16</sup> Measured in wet metric tonnes per annum (wmtpa)



Table 2-4 Contestable kaolin markets for high quality porcelain tableware production, by regions of interest

Country	000 tonnes kaolin per year	
	Contestable	Contestable
	2021	2026
China	200	260
Japan	30	40
Other	30	110
<b>Total</b>	<b>260</b>	<b>410</b>

The average annual production across the LOM for Great White CRM™<sub>P</sub> represents an indicative 30% share of the contestable 2026 market (125 kwmtpa<sup>17</sup>).

In Asia, First Test Minerals has advised on established products in the market (CIF Asia). As shown in Table 2-5, comparable products were considered in the same markets of interest. Andromeda considers that TGWP products can be comparable to Imerys' Kaopearl CNL30 and Imerys' Standard Porcelain.

Table 2-5 Established kaolin products into the tableware market from competitors<sup>18</sup>

Company	Country	Grade
Imerys	New Zealand	Premium Halloysite
Imerys	United Kingdom	Kaopearl CNL30/SSP
Imerys	United Kingdom	Standard Porcelain
Longyan	China	Longyan
AKW	Germany	Arcano

### 2.3.3 Competitive position in ceramic markets

Independent testwork conducted in Spain has identified the high quality characteristics of TGWP products for ceramics. Initial comparison work against competitors supports TGWP products as competitively positioned as shown in Figure 2-2.

<sup>17</sup> Measure in kilo wet metric tonnes per annum (kwmtpa)

<sup>18</sup> First Test Minerals, 2021

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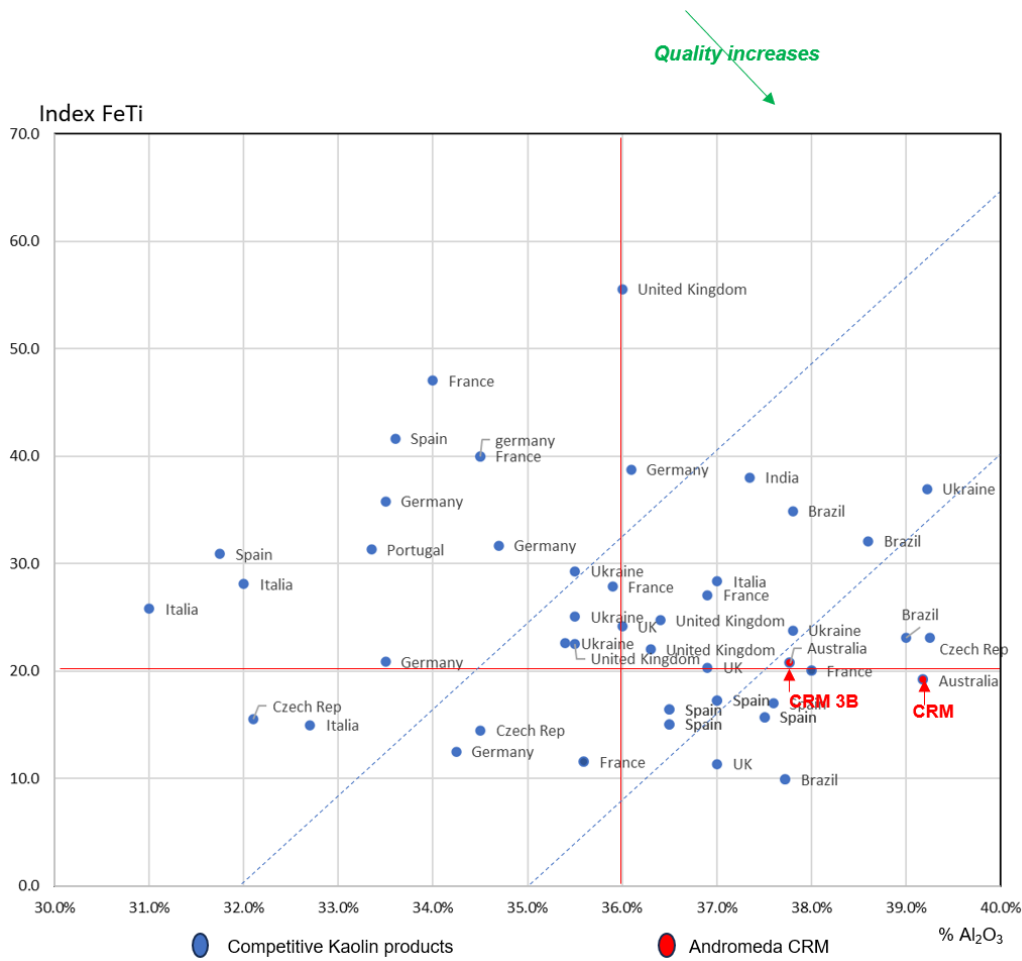


Figure 2-2 Competitive position of Great White CRM™ compared to other kaolin sources<sup>19</sup>

Of Andromeda's competitors, key international companies include Imerys, Sibelco and MCS, while domestic competitors include WA Kaolin and SUVO Strategic Minerals.

### 2.3.4 Low carbon concrete production markets

Complementary Business Products

Australia currently consumes around 12 million tpa<sup>20</sup> of cement with around half of this imported in the form of finished (powdered) cement or cement clinker. Cement is responsible for 8% of global carbon emissions or 3 billion tonnes of carbon dioxide (CO<sub>2</sub>) per annum. Cement is a major constituent material of concrete, which is the highest volume construction material consumed globally.

Work commissioned by Andromeda<sup>21</sup>, notes that the Great White HRM™ product could be marketed towards use in a global volume of approximately 1.8 billion m<sup>3</sup> pa concrete (excluding China). If China is added in along with bagged products (mortar, render, plaster, and grout) the total addressable market increases to approximately 2.5 billion m<sup>3</sup> pa.

<sup>19</sup> Work commissioned by Andromeda, 'Overview of the Ceramic tile market' (Galesk, 2023).

<sup>20</sup> Measured in tonnes per annum (tpa)

<sup>21</sup> Work commissioned by Andromeda, "Product Evaluation of Great White Halloysite Kaolin Clay (Great White HRM) for Andromeda Metals Pty Ltd" (Jackson, 2023).



In the Australian domestic market, Andromeda estimates a minimum total addressable immediate market in Australia of approximately 29 million m<sup>3</sup> pa for the concrete ready-mix sector. However, the marketing strategy is to gain initial traction within Australia and then roll out Great White HRM™ to the Asian market. The Asian market accounts for approximately 50% of the global concrete production and an addressable market of about 0.6 billion m<sup>3</sup> pa if China is included.

It is assumed that Great White HRM™ can replace the only competitive US mineral product in this market. Andromeda assumes a total contestable market of approximately 12.5 million m<sup>3</sup> equating to 125,000 t/pa - 250,000 t/pa of Great White HRM™.

### 2.3.5 Industrial sand markets

Complementary  
Business  
Products

The rising cost of sand<sup>22</sup> is inflating the price of materials such as concrete, highlighting its importance for global infrastructure projects. Sand is the world's most used natural material, mainly in construction. However, there is a global shortage of good quality construction sand including in Australia. These factors are making sand a strategic resource. There are two potential Andromeda sand grades planned. These are coarse sand (>500 µm) and fine sand (<500 µm).

Due to the nature of the sand industry, markets for these products typically confined to a small geographic area close supply. The nearest large concrete batch plant is approximately 100 km away from TGWP, with a demand of minimum 30 kt/pa of sand which is currently transported from over 300 km away. The characteristic of this local market makes this an immediate contestable opportunity which would consume all TGWP sand capacity from the Stage 1A Plant. In addition, two of Australia's largest underground mining operations are within supply distance of TGWP, both with significant operational need for sand.

## 2.4 An updated mine development plan that supports an accelerated sales profile and reduced costs across the LOM

Mine Response



LOM Plan + Mining Schedule

### 2.4.1 Update mining sequence

The detailed understanding of product specification provided by the commercial strategy and testwork conducted by the Institute of Ceramic Technology (ITC) in Spain was the driver for the review of the mining sequence and rationalised mining schedule. Andromeda's mine to market approach takes advantage of the deposit's heterogeneity to produce multiple high quality products. With the addition of Al:Fe ratio and using the Fe<sub>2</sub>O<sub>3</sub> and TiO<sub>2</sub> in the block model, the identified products were targeted for mining and stockpiling for ore blending into the processing plant. The location of the starter pit shown in Figure 2-3 was moved from the western edge to target the primary high-grade products and represents the mine response to the market to mine plan, identified in the commercial strategy.

The re-positioning of the starter pit provides for an ideal location to understand the variation in the ore and ensures access to the entire core product portfolio in year 1 of mining. The mining

<sup>22</sup> Financial Times, 9 May 2023

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sequence was then expanded with a series of staged pits to provide a mix of ore feed to the processing facility to support the sales plan. There is no change to the Ore Reserve with the change in product specification, there is however a change in the saleable products as a result of the accretive product selection and improved yield. The new mine schedule sits within the original life of mine final design with the strip ratio remaining unchanged. The staged approach remains the same with overburden being replaced into the depleted mine void to reduce overburden haulage and rehandling costs.

The new mining schedule and rationalised product mix reduced the need for larger areas open, which reduced the upfront stripping required. The result was a 53% slower mining rate, reducing the upfront costs while also providing required ore delivery.

15.1Mt JORC reserve delineated by core and complementary products aligned to market demand, presented in Figure 2-3.

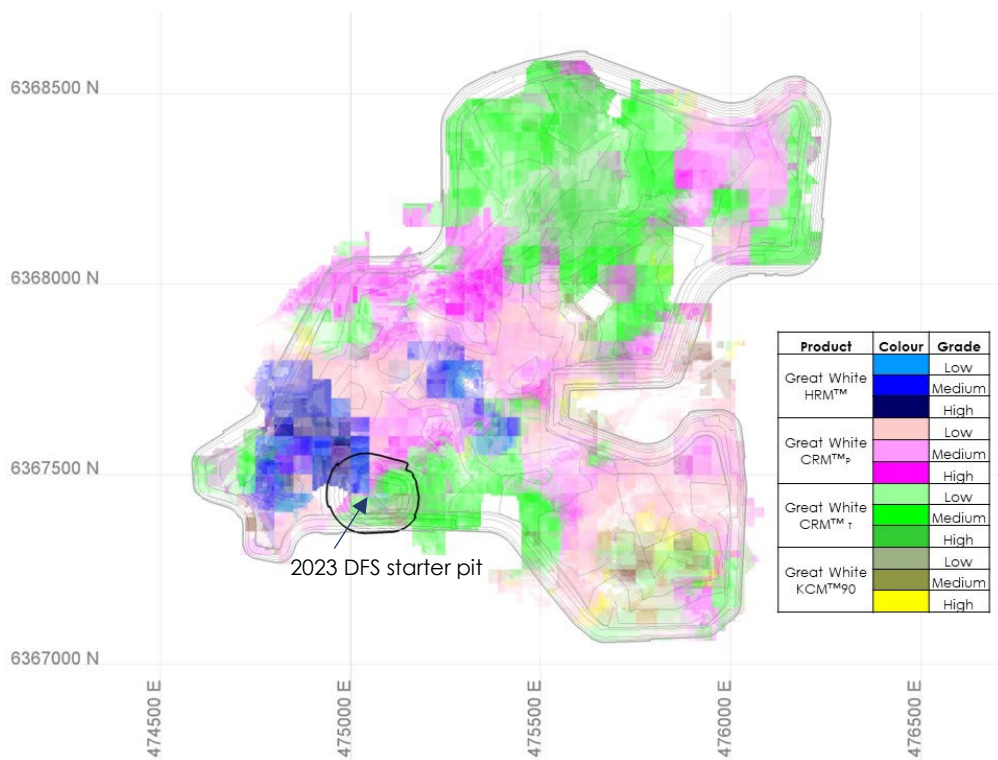


Figure 2-3 The Great White Project 2023 DFS starter pit position, products, and grades

### 2.4.2 Optimised product portfolio

#### LOM Plan + Mining Schedule

The primary driver of The Project's superior products is the quality of the resource with naturally high Al<sub>2</sub>O<sub>3</sub> and low impurities. The final determination of product specification with Great White CRM™ and Great White HRM™ provided for an optimal utilisation of the Resource into the Reserve for mining and blending ore into the products. The zones of very high Al<sub>2</sub>O<sub>3</sub> (>36%) naturally aligned with low Fe<sub>2</sub>O<sub>3</sub> and high TiO<sub>2</sub> for Great White CRM™<sub>r</sub>. Areas of high Al<sub>2</sub>O<sub>3</sub> (>35%) for the Great White CRM™<sub>p</sub> aligned high halloysite with lower TiO<sub>2</sub> for porcelain tableware. Ore zones that are suitable for Great White HRM™ carried the higher Fe<sub>2</sub>O<sub>3</sub> which is not a deleterious element for this product.

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The exclusion of very high specification, low yield Great White PRM™ from the identified product portfolio has significantly reduced the working capital and operating cost associated with the larger mining area, higher stockpile levels and lower yield. The identified product portfolio has reduced the mining footprint and slowed the sequence of overburden removal.

### 2.4.3 Commercialising Industrial Sand

Complementary  
Business  
Products

The comprehensive commercial strategy review identified an industrial sand supply shortage both domestically and internationally. TGWP contains a natural, angular industrial sand that is produced as a co-product of the kaolin refining process.

## 2.5 Improved Weighted Average Product Margin by 34% and \$450/tonne of Product

Marketing and Sales Strategy

### 2.5.1 Product pricing

Product pricing has been determined based on existing offtake agreements<sup>23</sup>, market and technical product validation by independent consultants, customer product validation, market research and market forecast data from TZMI.

Pricing for Great White HRM™ is included at conservative levels due to ongoing customer validation work.

### 2.5.2 Offtake Strategy

Andromeda's offtake strategy was a key piece of work completed to ensure the most effective approach in each of the target markets. Andromeda's offtake strategy is based on a hub and spoke model. Andromeda establishes its hub for each core and complementary business in a selected geographical region that is world-leading in the respective targeted market segment. The selection of each hub is for the required technical validation of Andromeda's matching core and complementary products.

Technical validation requires credible independent institutions and/or Andromeda partners with the requisite industry expertise, capability, and equipment to test and validate Andromeda's products. Where needed, these organisations can also guide product development for Andromeda to gain traction and grow in target markets.

Once technical validation is successfully achieved in Andromeda hubs, testing certification and technical information is leveraged for market penetration in targeted regions. Initially this is within hub regions and then into other prioritised regions that are influenced by hub regions. Andromeda services targeted markets through its working relationships and TGWP product delivery spokes.

Working relationships are established either directly by Andromeda with end use customers and/or with distribution partners, who in turn engage with end-use customers.

<sup>23</sup> Including long form offtake agreements and terms sheets.



Andromeda likewise delivers its products either directly to end use customers and/or to distribution partners, who in turn deliver to end-use customers.

The offtake strategy for the global high quality ceramic tiles market can be seen in Figure 2-4. Detailed offtake strategies for the high quality ceramic porcelain tableware market and for the global low-carbon concrete production market are in the 2023 DFS.

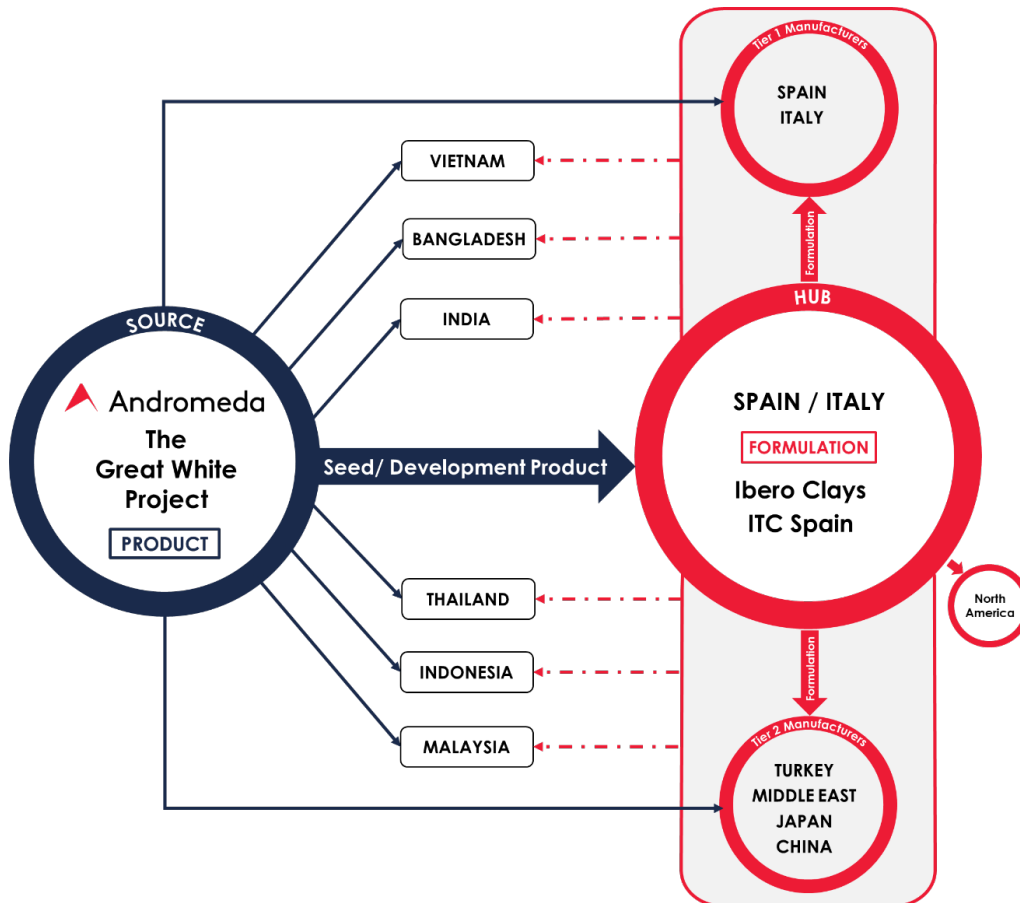


Figure 2-4 Andromeda's Offtake Strategy for the Global High quality Ceramic Tiles Market

### 2.5.3 Sales Agreements

Andromeda has secured a long form offtake agreement with Plantan Yamada Co Ltd, for the supply of Great White KCM™90 for porcelain tableware.

Andromeda has entered into a Terms Sheet with Foshan Gaoming Xing-Yuan Machinery Co. for the offtake of Great White CRM™ and Great White KCM™90.

Andromeda has entered into a Terms Sheet with IMCD for the exclusive sale in Australia and New Zealand of Great White HRM™.

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## 3 Low-carbon concrete production commercialisation opportunity



### 3.1 New regulations

As the year 2030 is fast approaching, the Australian Government has committed to reducing the CO<sub>2</sub> released into the atmosphere by 43% as compared to the levels in 2010. Reducing the total binder of concrete, which is predominantly Ordinary Portland Cement (OPC) will play a role in reducing total CO<sub>2</sub> emissions in concrete. Cement is responsible for 8% of global carbon emissions or 3 billion tonnes of Carbon Dioxide (CO<sub>2</sub>) per annum. Cement is the major constituent material of concrete which is the highest volume construction material consumed globally.<sup>24</sup> Forty of the world's leading cement and concrete manufacturers joined forces to accelerate the shift to greener concrete by pledging to cut CO<sub>2</sub> emissions by a further 25% by 2030, marking a decisive step in the race to 'Net Zero' concrete by 2050.

### 3.2 Un-calcined attributes

There is a current global initiative<sup>25</sup> funded by the Swiss Agency for Development and Cooperation through its Global Programme in Climate Change to reduce the CO<sub>2</sub> emissions from cement production by substituting approximately 30% of the cement with a calcined kaolin. This calcined kaolin is in a form known as metakaolin which has cementitious properties enabling it to partially take the place of cement. Metakaolin is produced by typically heating hydrous kaolin (the natural form) at about 800°C for one hour. Whilst this process has a vastly lower carbon footprint than cement production, it is still very energy dependent. Great White HRM™ however, is a pure natural hydrous kaolin that is produced using a simple de-sanding process without any chemicals. This gives it an extremely low carbon footprint even in comparison to metakaolin. The comparative effectiveness of Great White HRM™ is also considerably higher than that of metakaolin with only an addition level of approximately 0.1 wt% in concrete shown to give a reduction in cement of 7 – 8 wt%.

### 3.3 Rheology modification properties

Great White HRM™ is a naturally occurring halloysite-kaolin clay mineral which acts as a high performance, low dose rheology modifier for concrete and other high solids, water-based slurries. Its unique structure and surface chemistry gives strong interactions which creates a structure and enables coarse particles to be maintained in suspension. This allows concrete mix designs to be optimised to reduce the cement without detriment to end application properties. It also gives additional desirable benefits of better pumpability with reduced segregation and bleeding. These solids suspension properties also give the Great White HRM™ mineral additional interesting future opportunities in application areas of chemical additives, drilling fluids, fertilisers, animal feeds and paint.

<sup>24</sup>Climate Change - Reducing Australia's Emissions. Parliament of Australia. (Online)

<sup>25</sup>Limestone Calcined Clay Cement, [LC3 – Limestone Calcined Clay Cement](#). (Online)



## 4 Sustainability and how we manage ESG matters

### Sales and Operational Planning

Andromeda is committed to responsible financial and business practices, and the highest standards of corporate governance. Our focus is to responsibly develop our resources, safely and sustainably, for the long-term benefit of our stakeholders.

Andromeda strives to work collaboratively with all our stakeholders and aims to be a supplier, partner, and employer of choice.

We recognise the critical importance of sustainable practices across our business and are committed to minimising the impact of our operations on the environment, while supporting local communities and ensuring ethical business conduct.

As we mature as a company, we aim to move towards anticipated construction and eventual production, in a safe, ethical and sustainable way.

### 4.1 Environment

#### 4.1.1 Climate change and our commitment to Net Zero

As a concerned corporate citizen, Andromeda accepts that the activities associated with mining development and mineral extraction can contribute to rising global temperatures through greenhouse gas (GHG) emissions.

As the Company evolves, it plans to adapt its operations with contemporary, innovative mine design and processing solutions to support the transition towards a low-emissions future. Consequently, the Company is committed to reducing GHG emissions with the aspiration of achieving net zero emissions over time. To support this and will seek to develop an implementation plan for reporting climate disclosures using the Task Force on Climate-Related Financial Disclosures (TCFD) framework into the Company's suite of annual reporting documents.

#### 4.1.2 Greenhouse Gas (GHG) emissions

Although GHG emissions are lower than thresholds required for mandatory reporting under the National Greenhouse and Energy Reporting Act (NGER), Andromeda is committed to reporting Scope 1 & 2 GHG emissions in its Annual Report for the financial year 2023 onwards.

**Table 4-1 The Great White Project Annual Scope 1 & 2 Carbon Emissions**

Source	Annual Emissions † CO <sub>2</sub> -e	Specific Emissions † CO <sub>2</sub> -e / † product
Stationary Combustion – Gas	5,514	0.061
Stationary Combustion – Diesel	2,926	0.033
Transport Combustion - Diesel	133	0.001
Vegetation Clearing (one-off) <sup>26</sup>	108	0.000
Blasting	7	0.000
<b>Total</b>	<b>8,724</b>	<b>0.097</b>

<sup>26</sup> Impact of 3,240 † CO<sub>2</sub>-e one-off emissions due to land clearing as amortised over the life of The Project.

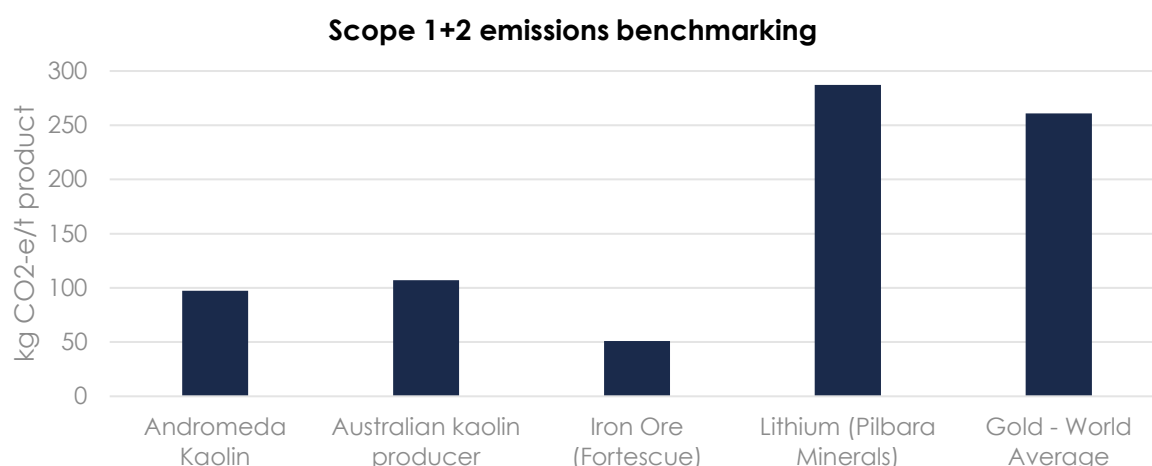
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As shown in Table 4-1, the largest contributor to carbon emissions is due to gas being used to generate electricity to power processing operations and heat to dry processed kaolin product.

In determining how to generate power and heat for TGWP, an analysis conducted by external engineering consultants which evaluated a number of electrical and heating options. The analysis found that the generation of electricity with gas fired turbines and the reheating of exhaust with gas fired burners for the purpose of drying processed product, delivered the lowest net present cost option.

The calculated Scope 1 & 2 GHG emissions expected to be generated by TGWP were also benchmarked against other kaolin and mining peers (see Figure 4-1) benchmarks.<sup>27</sup>



**Figure 4-1 Industry benchmarking of TGWP's Cope 1 & 2 GHG emissions**

For Stage 1A, it is estimated that the Scope 1 & 2 emissions (mine to gate) will be 0.097 t CO<sub>2</sub>-e per tonne of product<sup>28</sup>, equating to kilogram per revenue figures of 0.17 per Australian dollar and 0.29 per Euro at full production.

Scope 3 emissions (gate delivered to port) are estimated at 0.184 t CO<sub>2</sub>-e/t (Table 4-2), with Andromeda intending to reduce its operational carbon footprint as production expands.

**Table 4-2: TGWP Annual Scope 3 Carbon Emissions**

Source	Annual Emissions t CO <sub>2</sub> -e	Specific Emissions t CO <sub>2</sub> -e / t product
Freight Product to Port	9141	0.102
Sea Freight to Europe	6423	0.071
Gas Freight To Site	108	0.001
Diesel Freight To Site	16	0.000
Regular General Freight to Site	27	0.000
Regular waste freight from site	20	0.000
Employee Regular Commute to Site bus	117	0.001
Employee Regular Commute to Site car	131	0.001
Employee Regular Commute to Bus	103	0.001
Employee Regular Air Travel	50	0.000
Landfill Emissions	389	0.004
<b>Total</b>	<b>16,525</b>	<b>0.184</b>

<sup>27</sup> This information was prepared by specialist consultant Ammjohn

<sup>28</sup> t CO<sub>2</sub>-e/t refers to tonnes of equivalent carbon dioxide per tonne of product.

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### 4.1.3 Water Management

The Project plans to access the mains water supply from the SA Water pipeline at Poochera. During construction, commissioning and Stage 1A of the plant water will be supplied using road tanker during construction and commissioning.

For further stages of processing to commence on site a pipeline will be installed from the local SA Water network at Poochera to the site. Additional water for dust suppression, wash water, etc. will be collected from rainwater, process water, water collected through dewatering boreholes and the mine pit, and water reclaimed from mined material.

Water used for dust suppression will be minimised using binding agents that keep moisture in the roads and hold the dust particles together.

A reverse osmosis (RO) system will be installed to recycle of the processing water on site, leading to over 90% of water being recycled and minimising any impact on local water resources.

### 4.1.4 Environment Monitoring

Comprehensive environmental monitoring is required for The Project. Specific details and requirements have been committed to as a result of the ML assessment and subsequent Program for Environment Protection and Rehabilitation (PEPR). These include groundwater, air quality, meteorological, noise, and vibration and blast overpressure monitoring.

### 4.1.5 Community and Stakeholder Engagement

Andromeda is committed to effective, ongoing, and transparent consultation with stakeholders directly and indirectly impacted by The Project. This includes local landholders, First Nations, business, and community groups.

Andromeda is also committed to developing long term relationships with each stakeholder group and will work with them to minimise potential negative impacts and maximise beneficial outcomes of The Project for the local, regional and broader South Australian community.

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## 5 Key 2023 DFS metrics

Comparison of key metrics from the 2023 DFS to the 2022 DFS are presented in Table 5-1.

Table 5-1 Key Metrics Comparison (pre-tax)

2022 DFS		2023 DFS
\$613 million	<b>NPV<sub>8</sub><sup>29</sup></b> <b>+65%</b>	<b>\$1,010 million</b>
\$4,706	<b>Revenue</b> <b>+32%</b>	<b>\$6,207 million</b>
300,000 tpa	<b>Kaolin Production Target<sup>30</sup></b> <b>0%</b>	<b>300,000 tpa</b>
15.1Mt	<b>Ore Reserve<sup>31</sup></b> <b>0%</b>	<b>15.1 Mt</b>
28 years	<b>LOM</b> <b>0%</b>	<b>28 years</b>
\$337 / tonne	<b>Weighted Average Product Margin<sup>32</sup></b> <b>+34%</b>	<b>\$450 / tonne</b>
\$82 million	<b>Average Annual EBITDA</b> <b>+59%</b>	<b>\$130 million</b>
\$207 million	<b>Capital Costs<sup>33</sup></b> <b>-9%</b>	<b>\$188 million<sup>34</sup></b>
\$26 million	<b>Sustaining Capital</b> <b>+36%</b>	<b>\$35 million</b>
36%	<b>IRR</b> <b>+9%</b>	<b>45%</b>
5.9 years	<b>Payback Period<sup>35</sup></b> <b>-14%</b>	<b>5.1 years</b>

<sup>29</sup> All dollar values are undiscounted other than NPV<sub>8</sub>.

<sup>30</sup> Kaolin final production volume as measured in tonnes per annum (tpa) and excludes sales of industrial sand. The staged ramp-up as follows:

2023 DFS	Stage 1A – 50,000 tpa	Stage 1B – 150,000 tpa	Stage 2 – 250,000 tpa	Stage 3 – 300,000 tpa
2022 DFS	Stage 1 – 150,000 tpa	Stage 2 – 150,000 tpa	Stage 3 – 300,000 tpa	Stage 4 – 300,000 tpa

<sup>31</sup> JORC compliant Ore Reserve remains as lodged in ADN ASX announcement dated 6 April 2022 titled *Great White Kaolin Project - Definitive Feasibility Study and Updated Ore Reserve*.

<sup>32</sup> Includes incremental revenue from sales of Industrial Sand as a co-product in the calculation

<sup>33</sup> Capital costs for each stage of production are as follows:

2023 DFS	Stage 1A – \$62.4m	Stage 1B – \$57.6m	Stage 2 – \$57.2m	Stage 3 – \$10.9m
2022 DFS	Stage 1 – \$93.8m	Stage 2 – \$11.0m	Stage 3 – \$73.8m	Stage 4 – \$28.3m

<sup>34</sup> Capital costs of \$3.1 million have been incurred since the 2022 DFS for capital items (long lead items) and land related payments. In addition, capital costs in 2023 DFS have been impacted by favourable product mix.

<sup>35</sup> Payback period includes capital costs of Stages 1A, 1B and 2. Capital costs of Stage 3 intended to be funded by cash flows from The Project.

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### Tax treatment

- Andromeda continues to report on a pre-tax basis, given it has \$191 million in available tax losses to June 2022, reducing taxes payable on any future profits, subject to the normal tax rules to carry forward losses.

### Assumptions and Financial Notes:

- The 2023 DFS financial model methodology has been verified by independent financial consultant.
- A discount rate of 8% has been used.
- A revised foreign exchange rate of AUD:USD 0.675 (2022 DFS 0.74) has been applied.
- Product pricing is commercially sensitive and legally restricted, and has not been disclosed in this document.
- The Great White Project results in Table 5-1 are based on the same Ore Reserve reported with the 2022 DFS<sup>36</sup>. The Ore Reserve estimate supporting the production targets and in turn the forecast financial information based on those targets, has been prepared by a Competent Person in accordance with the JORC Code requirements. Accompanying Competent Persons consent statements for this document applicable to the JORC 2012 Code for the publication of the Ore Reserve estimate are included at the end of this Announcement.
- The Ore Reserve estimate classified as being Proved has been derived from the Mineral Resource classified as Measured only. The Ore Reserve estimate classified as being Probable has been derived from the Mineral Resource classified as Indicated only. The Ore Reserve comprises of 34% Proved Reserve and 66% Probable Reserve (Table 2)<sup>37</sup>. The Production Target comprises of 34% Proved Reserve, 65% Probable Reserve and 1% Inferred Resources. Inferred Resources are not included in the Reserve and are not considered within the pit design process. There is a low level of geological confidence associated with Inferred Mineral Resources and there is no certainty that further exploration work will result in the determination of Indicated Mineral Resources of that production target itself will be realised.
- Metallurgical test work has been completed by reputable laboratories experienced in kaolin processing. This testwork supports modifying factors applied in the Ore Reserve estimate.
- The mining process has been based on Measured and Indicated Mineral Resources reported in accordance with the 2012 JORC code, together with mine designs and scheduling, geotechnical parameters and mining equipment determined from experienced mining engineers.
- The processing plant design has been developed by Andromeda personnel with experienced process engineers to support the flowsheet and the predicted yield, throughput, and production estimates of The Project.
- The infrastructure requirements have been defined by specialist engineers in conjunction with The Project Team.
- The detailed designs discussed in the 2023 DFS have been used as the basis for capital and operating costs estimates which have been corroborated by suppliers, contractor and vendor quotes.
- The new mine royalty rate of 2.00% will apply until 30 June 2026 and then increase to 3.5% thereafter.
- Corporate costs of \$1m per annum have been allowed for in respect of charges for centralised services and resources that may be utilised, such as accounts payable, legal, marketing and project management.
- No allowance has been made for the following items in the operating cost estimate:
  - Exchange rate variations
  - Escalation
  - Project financing costs
  - Interest charges

<sup>36</sup> The material assumptions underpinning the Ore Reserve estimate published in April 2022 continue to apply and have not materially changed, Refer to ASX announcement 6 April 2022 'Great White Kaolin Project – Definitive Feasibility Study'.

<sup>37</sup> The material assumptions underpinning the Ore Reserve estimate published in April 2022 continue to apply and have not materially changed, Refer to ASX announcement 6 April 2022 'Great White Kaolin Project – Definitive Feasibility Study'.



- All goods and services tax (GST), import duties, surcharges and any other statutory taxation, levies or government duties are excluded.
- No allowance for contingency has been made in the operating cost estimates.
- The mining method will be conventional earth moving.
- The processing method will be blunging, separation, dewatering, product drying and packaging.
- The Company will receive all authorisations required to sell industrial sand and increase processing of kaolin ore beyond 300,000 tonnes per annum.
- The average annual processing rate will be ~93,000 tpa (17 months), ~298,000 tpa (2 years) ~504,000 for 2 years and 612,000 tpa (21.5 years).
- Average annual saleable production 45,000 tpa (17 months), 142,000 tpa (2 years), 250,000 tpa (2 years) 297,000 (21.5 years).
- Mine life is 28 years.
- Accuracy of data is to  $\pm 15\%$ .

## 6 Capital Costs

The Project is prepared to an accuracy level of  $\pm 15\%$  guided by the requirements of the Australian Institute of Mining and Metallurgy (AusIMM) guidelines (*AusIMM 2012. Cost Estimation Handbook. 2nd Edition, Monograph 27. The Australian Institute of Mining and Metallurgy*). The capital cost estimate for The Project has been developed by Andromeda in collaboration with its technical and engineering consultants, Ammjohn PE Pty Ltd (Ammjohn). The capital cost estimates are presented in first quarter 2023 Australian dollars (AUD) to an accuracy of:  $\pm 15\%$  (Table 6-1).

**Table 6-1 Processing Plant Capital Cost Estimate Accuracy**

Processing Plant	Class of Estimate	Accuracy
Stage 1A	Class 2	$\pm 10\%$
Stage 1B	Class 3	+15% / -10%
Stage 2	Class 3	+15% / -10%
Stage 3	Class 3	+15% / -10%

The 2023 DFS presents a 28-year mine life. The overall capital cost estimate (excluding contingency and sustaining capital expenditure) is shown in Table 6-2.

**Table 6-2 Capital Cost Estimate – WBS Summary**

WBS category	Stage 1A A\$ '000s	Stage 1B A\$ '000s	Stage 2 A\$ '000s	Stage 3 A\$ '000s	Total LOM A\$ '000
Project Management, Approvals & Design	9,424	5,170	4,020	2,120	20,734
Construction	38,881	46,464	42,799	7,710	135,854
Operations Readiness	3,226	533	193	50	4,002
Mine Development	1,375	-	-	-	1,375
Rehabilitation	4,454	200	5,000	-	9,654
Sales and Marketing	352	-	-	-	352

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<b>Total Capital Cost Estimate (excluding contingency)</b>	<b>57,712</b>	<b>52,367</b>	<b>52,012</b>	<b>9,880</b>	<b>171,971</b>
<b>Contingency</b>	4,663	5,237	5,201	988	16,089
<b>Total Capital Cost Estimate (including contingency)</b>	<b>62,375</b>	<b>57,604</b>	<b>57,213</b>	<b>10,868</b>	<b>188,060</b>
<b>Sustaining Capital Expenditure Estimate</b>					34,880
<b>Total Capital Cost Estimate</b>					<b>222,940</b>

Capital expenditure for each stage has been time-phased based on the following:

lead times for major components provided by Ammjohn and vendors

payment profile based on negotiated offers from contract execution to successful completion of site acceptance testing

expenditure has been assumed over a 16-month construction program period

## 6.1 Contingency

A contingency of between 8% and 10% has been applied to The Project's work breakdown structure (WBS) elements, allocated by The Project team based on confidence in the element, resulting in net contingency of 9%.

## 6.2 Sustaining capital expenditure

Sustaining capital expenditure has been allowed for on a percentage of total project capital expenditure basis:

A rate of 0.75% of total capital expenditure has been applied on an annual basis; and

That annual expenditure has commenced during the year following, commissioning and initial warranty periods.

The resulting LOM sustaining capital expenditure is \$35.47 million.

## 7 Operating costs

The operating cost estimate for TGWP has been developed for the 2023 DFS by Andromeda in collaboration with Ammjohn. Contractor costs have been collected through budget estimations provided by contractors specialising in their field of expertise.

Supply chain and operating consumable for The Project are minimal with all materials, feed stocks, and reagents readily available and easily transported and stored on site. Reagents are limited to readily available standard anionic flocculant.

The operating cost estimates are presented in Australian dollars (AUD). Basis pricing obtained during the January 2023 quarter was to an accuracy of  $\pm 15\%$ .

A summary of operating costs for the production cases is shown in Table 7-1.

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Table 7-1 LOM summary operating cost

Cost Centre	Life-of-mine AUD '000s	LOM AUD/t ore processed
Mining	188,058	12.56
Processing	581,365	38.81
General & Administration	97,694	6.52
<b>Total Production Operating Costs</b>	<b>867,117</b>	<b>57.89</b>
Logistics – Transport & Shipping <sup>1</sup>	1,699,437	113.46
Royalties & Government Charges	156,798	10.47
Corporate & Other	28,000	1.97
<b>Total Non-Production Operating Costs</b>	<b>1,884,235</b>	<b>125.80</b>
<b>Total Operating Costs</b>	<b>2,751,352</b>	<b>183.69</b>

<sup>1</sup>Individual truck weights will be managed by haulage company.

Operating costs have been calculated for mining, processing, transport and handling, and support services required for the operations at The Project.

## 8 Planned Development pathway

The Project scope will be executed under an Owner Direct Managed strategy, with a dedicated Andromeda Owner's Team (**OT**). The OT will manage the delivery and receive technical support from the Engineering Service Provider (**ESP**). The core of the OT are Andromeda staff with Ammjohn, appointed as the ESP for both the design and execution in phases. On site construction will be minimised by incorporating modular designs for the fixed plant structures. Operations will be executed using a contracting model to establish The Project, contracting companies will supply the equipment, trained operators and the systems required to manage and report as regulated. Mining and associated civil works will be undertaken by local contracting companies under a unit rate contract. Haulage of product to port will be undertaken by contractors with loading and unloading ability along with the systems required for heavy haulage driver management.

The planned development pathway schedule of The Project Milestones is shown in Figure 8-1.

Stage	Stage 1A	Stage 1B	Stage 2	Stage 3
Commissioning	Oct 2024	Dec 25	Dec 2027	Dec 2029
Kaolin production	50,000 tpa	150,000 tpa	250,000 tpa	300,000 tpa

Figure 8-1 Planned Development pathway

The 2023 DFS is based on a staged expansion (Stage 1A, 1B, 2 and 3), and currently has a 28-year mine life. The processing method has been updated to provide an improved mine to market response. The 2023 DFS covers the four-stage development of The Project to ramp up to full anticipated production of 300 ktpa<sup>38</sup> over the 4 stages. The production summary across the LOM can be seen in Table 8-1.

<sup>38</sup> Measured in kilotonnes per annum (ktpa)





Table 8-1 Production Summary (wet metric product tonne) across the LOM

Production Summary							
Product	Great White CRM <sup>TMp</sup>	Great White CRM <sup>TMt</sup>	Great White KCM <sup>TM90</sup>	Great White HRM <sup>TM</sup>	Coarse Sand	Fine Sand	Total with sand
<b>Wet metric product tonne</b>	3,485,588	3,518,962	305,881	750,374	4,459,008	1,486,336	14,006,149

The staged approach provides for the controlled development of The Project to allow for learning and incorporation of efficiencies. Stage 1A incorporates a slower mining rate to provide for the exposing of the ore and building the grade control systems in a high grade portion of the orebody. A three month ramp up and commissioning period has been included to ensure that the mining, ore feed and processing can be started, safely and ensuring that the process can be set up to meet the product specification as designed. The mining rate increases over The Project to meet the increased staged feed requirements. The mining production rate is relatively small compared to most Australian mining operations and with a strip ratio of 2.5, the total movement at full production is very achievable.

The key authorisations required for The Project are outlined below in Table 8-2.

Table 8-2 The Key Authorisations

Authorisation	Details
<b>Mining Lease 6532</b>	Granted 17/12/21 for a period of 35 years. Authorises: <ul style="list-style-type: none"> <li>mining operations for the recovery of 'Minerals' (including but not limited to kaolin)</li> <li>the sale and disposal of Minerals recovered</li> <li>the management and use of Extractive Minerals (including sand) produced in the course of carrying out mining operations, but excludes the sale of extractive minerals (which requires a change in operations to be authorised under s56Q of the Mining Act).</li> </ul>
<b>Miscellaneous Purpose Licence 164</b>	Granted 17/12/21 for a period of 35 years for the construction of an access road.
<b>Program for Environment Protection and Rehabilitation (PEPR)</b>	PEPR for Stage 1A and 1B approved by DEM on 1 March 2023. Further PEPR(s) will be required for expansion of the Project beyond Stage 1A and 1B and the sale of extractive minerals
<b>Land Access and waiver of exempt land status</b>	Agreement for the purchase of underlying land secured, subject to subdivision and boundary realignment. Access to land secured pre-settlement for preparatory works, mine construction and mining activities, with exempt land status waived.

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## 9 Product Lifecycle Comparison Table

Core, complementary and adjacent products will go through a product lifecycle assessment (Table 9-1) as part of the commercialisation process. This is outlined in detail in the commercial strategy map.

Table 9-1 Andromeda Product Lifecycle Comparison Table

Market and Technical Validation Element	Great White CRM™	Great White KCM™90	Great White HRM™	Industrial Sand	HPA
Determine key market segments	✓	✓	✓	✓	✓
Conduct initial process testwork	✓	✓	✓	✓	✓
Conduct initial product testwork	✓	✓	✓	✓	Planned
Identify addressable market	✓	✓	✓	✓	✓
Value in use assessment	In progress	In progress	In progress	n/a	Planned
Identify contestable market share	✓	✓	Planned	Planned	Planned
Conduct commercial scale pilot trials	In progress	In progress	Planned	Planned	Planned

### 9.1 Great White CRM™ Product Lifecycle

1. The premium grade ceramics market was identified due to the rare and valued combination of halloysite and low critical impurities.
2. Initial application testwork for suitability in high-end ceramic applications was conducted by independent experts in the UK, China, Italy, Vietnam, Japan and Thailand.
3. The relevant addressable market was identified based on the technical data obtained from the extensive testing. This was done by using relevant market reports, sampling target customers and by engaging independent market consultants with a strategically targeted scope of work.
4. Value in use assessment is in progress but well advanced using Spanish industry experts which is recognised as the global leading region for the addressable market identified. Great White CRM™ is being benchmarked against the world leading kaolin grades for use in premium grade ceramics by the ITC.
5. The contestable market for Great White CRM™ has now been identified by using the results from this benchmarking exercise and referencing all of the relevant market intelligence.
6. Commercial scale plant trials are now in progress with ceramic industry formulators and selected end users for specific use in the identified contestable market.

### 9.2 Great White HRM™ Product Lifecycle

1. High solids aqueous slurry applications were identified as a potential application for Great White HRM™ due to the unique combination of surface chemistry, particle size and particle morphology.
2. Extensive initial application testwork was done using an independent Australian concrete expert (HPSC) to establish product dosing, usage, effectiveness, and suitability. Great White HRM™ was also certified for use under the Australian Concrete Industry standards during this stage.

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3. The data from this testing enabled the immediate addressable market to be identified and this was aided by the growing pressure for the construction industry to decarbonise.
4. When product development for Great White HRM™ started the main objective was to use the unique product properties to give a range of performance benefits in concrete and other building products. However, in the advent of the global initiative to decarbonise the construction sector, it was recognised that Great White HRM™ could also be used for this purpose.
5. A qualified independent expert was then engaged to quantify the potential decarbonisation credentials of Great White HRM™ by conducting a large testing program in strategically identified concrete mix designs. These results are now being used to identify the value in use based on carbon reduction capability as well as potential performance improvements.
6. The immediate contestable market share has been identified based on the independent testing work along with the previous HPSC work in specific concrete mix designs. Domestic and global production data was obtained from concrete industry market reports which allowed the contestable share to be quantified.
7. Commercial scale concrete testing is currently in progress with selected targets.

### 9.3 High Purity Alumina (HPA)

HPA has been identified as an adjacent product on the basis of preliminary process testwork. Further testing needs to be done to determine its suitability to become a complementary product.<sup>39</sup>

The following preliminary work has been undertaken:

Key market segments have been determined as:

- Synthetic sapphire which is used to make light emitting diodes (LEDs), sapphire glass and semi-conductors.
- Separator coating in lithium-ion batteries.

Initial process testwork has included:

- Bench scale testing of conceptual flowsheet with ALS Global
- Technical due diligence with technical experts including
  - Duncan Seddon and Associates
  - Australian National Science and Technology Organisation (ANSTO)

Identification of addressable market has included consideration of:

- Quality grades of 99.99% (4N) HPA up to 99.9999% (6N) HPA which attract premium pricing.
- Projected shortfalls in supply (supply deficits) of circa 5 ktpa by 2025, ramping up to over 25 ktpa by 2028 (CRU, 2019).

<sup>39</sup> The 2023 DFS does not include any financial contribution based on HPA production.



## 10 The Great White Project Mineral Resource

The Great White Project deposit is a naturally high purity, bright white kaolin with low levels of impurities, specifically Fe<sub>2</sub>O<sub>3</sub>. The in situ Mineral Resource Table 10-1 is estimated to yield 17.4 Mt of High Bright (ISO B >75%) kaolin product, when applying the minus 45 µm recovery factor. Approximately 50% of the material defined is largely residual quartz derived from the weathered granite.

Table 10-1 2020 Great White Kaolin Mineral Resource minus 45µm fraction

Class	Mt	ISO B	Kaolinite (%)	Halloysite (%)	Al <sub>2</sub> O <sub>3</sub> (%)	Fe <sub>2</sub> O <sub>3</sub> (%)	TiO <sub>2</sub> (%)
Measured	2.9	83.9	78.8	13.8	36.7	0.52	0.32
Indicated	7.3	82.8	82.3	9.9	36.6	0.51	0.50
Measured + Indicated	10.1	83.1	81.3	11.0	36.6	0.51	0.45
Inferred	7.2	83.3	81.7	9.9	36.4	0.51	0.45
<b>Total</b>	<b>17.4</b>	<b>83.2</b>	<b>81.5</b>	<b>10.5</b>	<b>36.5</b>	<b>0.51</b>	<b>0.45</b>

## 11 Processing Testwork and Ore Characterisation

Market and Technical Validation

### 11.1 Ore mineralogy

The mineralogy of The Project has been extensively studied throughout its history, specifically within the -45 µm fraction. The mineral assemblage across the orebody was determined by x-ray diffraction (XRD) carried out by CSIRO.

The orebody is predominantly quartz sands (~ 45 % - 55 %) and clay (~45 % - 55 % kaolinite and halloysite). Testwork has shown that traditional screening along with the use of hydrocyclones is effective to remove the sands. This is as a result of the difference in grain size of the two components. Quartz is extremely coarse, >45 µm when compared with the clay <25 µm.

### 11.2 Testwork

Andromeda assumed control over The Project in 2018. Since then, a comprehensive series of trials and tests have been undertaken utilising third parties with relevant technical expertise.

The detailed third-party testing supported by confirmation trials at Andromeda's Streaky Bay Pilot Plant (SBPP) has enabled the development, with a high level of confidence, of the process flow sheet for The Project.

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### 11.3 Processing Flowsheet

As a result of the testwork conducted, flow sheets were developed for The Project and its products. The flow sheet involves the blunging, screening and hydrocyclone separation to achieve the required product specification. The difference between the products being the level of hydrocyclone separation required. Following separation the product is dewatered, extruded into noodles and dried before being shipped to the customer.

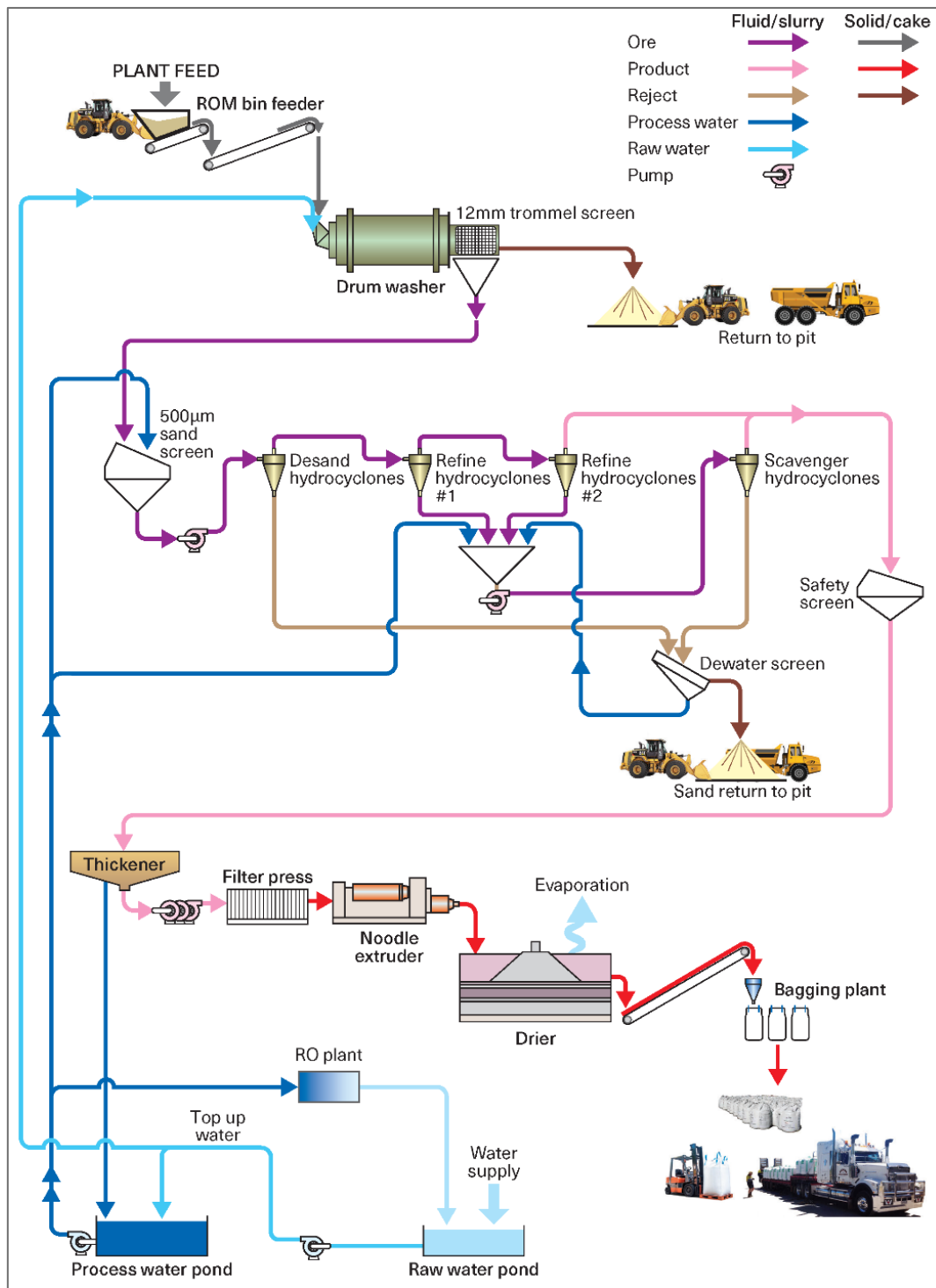


Figure 11-1 Great White Flowsheet

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## 12 Mineral Processing and Plant Engineering

The plant construction has been segregated into a number of stages to ramp up capacity in line with projected demand.

The plant design has progressed since the 2022 DFS with a Front End Engineering (FEED) 30% design for the Stage 1A plant being completed by Ammjohn.

Design studies have also been undertaken by Ammjohn for the following Project stages.

The Project proposes wet processing of kaolin ore to produce products consisting of Great White KCM™90, Great White CRM™T, Great White CRM™P, Great White HRM™ that involve the following operations:

Feeding the run-of-mine (ROM) kaolin into the processing plant using a front-end loader (FEL).

Blunging the raw kaolin into a slurry using a drum washer.

Adjusting the particle size distribution of the product using screen and hydrocyclones to meet product specifications.

Dewatering, noodling and drying the kaolin including a back mixing system to control dryer feed moisture.

Preparing the kaolin product for sale to regional and export markets via port facilities or at mine-gate for local customer

Loading the product onto trucks for transport off site.

The key benefit of wet-processing over dry-processing is the significant improvement in recovery of additional valuable kaolin clay.

The 2022 DFS was structured around a 4-stage development with a production ramp up starting at 150,000 dry tpa of Great White KCM™90 and working up to a full production rate of 300,000 dry tpa of various kaolin products including Great White PRM™.

The 2023 DFS further refines the 2022 DFS scenario, focussing on the start of operations with the 1A plant capable of producing 50,000 dry tpa of refined kaolin product and develops the production expansion path to a final nominal capacity of 300,000 dry tpa of business accretive products. Production of the capital and operating intensive Great White PRM™ was dropped.

The kaolin processing flowsheet was developed, based upon test work conducted over an extended period, by a selected group of respected local and international test houses. Further verification of the developed flowsheet was obtained through extensive testing.

## 13 Workforce

There will be a direct workforce (incl. haulage and other services) of approximately 46 people for Stage 1A of The Project. Employees will be sourced from the local area wherever possible, and where required skills are not available, will be brought in and assisted in relocation to the area.

Andromeda intends to train and employ local and regional people wherever appropriate. Andromeda will work with the First Nations, government agencies and community groups to ensure appropriate training programs are in place to provide genuine opportunities for members of the local community to obtain employment at The Project. Andromeda will also implement 'Cultural Awareness' training for employees and contractors.

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As employment opportunities arise, Andromeda will post job advertisements to the local community via District Council of Streak Bay and regional news avenues as well as with Wirangu representatives for their consideration. Indigenous employment will be encouraged and discussion with relevant parties will continue to determine how this could be successfully implemented (e.g. including the possibility of contracting local Indigenous businesses).

Andromeda will take a risk based, systematic and best practice approach of managing work health and safety (WHS) which is consistent with good business practice and ensuring that WHS processes are integrated into all aspects of business. The basis of this strategy is outlined in the Andromeda Health Safety Environment and Community (HSEC) Management System which will be developed to provide a framework of policies, processes, and plans that enable a consistent approach, providing opportunities for review and continuous improvement.

## 14 Logistics

### Sales and Operational Planning

Andromeda reviewed various logistics options for The Project over the period of scoping, 2022 DFS and this 2023 DFS. Bulk DSO, bulk product, bagged final product, bagged noodled and bagged filter cake product were all considered as product options for supply to customers from The Project. Andromeda has reviewed transport and route alternatives to identify the most appropriate for The Project.

Current customer requirements dictate that TWGP refined products are to be transported in either bulka bags or lined containers. Dependent on availability, food grade containers may be used. Bulka bags are sealed from moisture ingress and contamination, are easily separated for distribution to end users and acceptable by offtake partners for handling across international ports. Lined, or food grade containers similarly provide protection from moisture ingress and product contamination but also provide flexibility in shipment sizes and frequencies.

For transport to customers in this 2023 DFS, product is scheduled to be shipped by container for the first two years, transitioning to break-bulk in year three. All containerised products will be shipped out of the Flinders Adelaide Container Terminal in Port Adelaide. Containerised product will be transported from site by road on trucks to the intermodal terminal at Bowmans. Bowmans is the nearest access to the standard gauge rail line linking Perth to Adelaide. At Bowmans, containers will be lined and loaded with product and placed on rail to be transported directly into Port Adelaide. This combination of transport methods has a number of cost saving benefits, namely reducing the need to transport empty containers to site, reducing container hire, Bowmans has room for stockpiling products to build up shipment parcels, reducing the likelihood of road congestion at the port and is considered dock side for customs requirements.

Break-bulk product is planned to be shipped from the Port of Whyalla. Bagged product will be transported by road on trucks and stored to meet shipment parcel sizes for export to international markets.



## 15 Corporate and Project Risks

A project risk assessment was carried out by Andromeda with contributions from specialist processing, mining, environmental, and transport consultants. The risk assessment was prepared in accordance with ISO 31000 risk management principles and guidelines (ISO 2009). The purpose of this assessment was to identify high-level risks so that they could be prioritised, treatment options could be developed, and preventative or mitigative actions could be initiated in advance of project activities.

Risk management is a critical part of the development and operating strategy used in assessing the viability of a mineral deposit and proceeding to a decision to mine. Risk management will be ongoing and subject to regular review.

A risk register has been prepared with the identified risks, together with mitigation strategies.

The Andromeda top 10 Corporate risks, and mitigating controls, currently identified in the strategic risk register are summarised in Table 15-1 below.

**Table 15-1 Corporate Risks**

Risk	Controls
<b>Major and unrecoverable failure to deliver on material announced project outcomes</b>	New business opportunities must progress through a business development framework with a stage gate approval process before they are accepted, implemented and announced.
<b>Funding is not adequate to start projects or operate the business</b>	A diversity of debt and equity funding options created through relationships with multiple brokers and debt/equity funding providers. A delegation of authority controls spend levels. An enterprise management system (EMS) is in place to manage business purchases. A budgeting process in place to plan and approve project spends. Capital Expense Form implemented to get sign off on project spend
<b>Failure to effectively respond to and mitigate significant competitor activity</b>	Monitoring customer activity and prioritising establishing and building relationships with key customers.
<b>Lack of diversity in customers and their geographies</b>	A diversity of products offered directly and through partners for customers in a range of domestic and targeted international markets.
<b>Failure to protect intellectual property or competitive advantage from competitors/customers</b>	Specialist intellectual property advisors engaged for intellectual property protection and subject matter experts for technical and commercial due diligence. First mover advantage to enter into specific market. Significant time and resources required for competition to gain approvals, construct a processing facility and start production.
<b>Failure to adequately consider ESG risks leading to loss of social license to operate</b>	As move into production, aspire to adopt, monitor and report on relevant frameworks and metrics that emerge from the developing consensus and convergence of ESG standards. ESG review is part of the SA Mining Regulators' (SA dept of Energy and Mining) approval process. Governance process overseen by AND Independent Board of directors.

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	Key stakeholder requirements considered as part of this process.
<b>Failure to commercialise and/or scale key products at a sufficient speed</b>	Establishing and building relationships with partners for the commercialisation of company-driven product research and development Anticipated a staged production ramping process to align with proposed market growth.
<b>Legal and regulatory compliance failure</b>	A suite of implemented policies and procedures are supported with regular legal and regulatory development updates. ADN has implemented a Safety Management System (SMS) to comply with ISO 45001 and ISO 14001 Approved Program for Environmental Protection and Rehabilitation to satisfy ML 6532 conditions. Integrate reporting requirements into SMS
<b>Counter parties default or renege on material contracts</b>	Company standard contracts utilised by in-house legal counsel with external support by specialist legal advisors, as required. Counterparties selected based on reputation as well as the strength of their tenders
<b>Inability to secure additional offtake agreements at the assumed pricing</b>	Product pricing has been determined based on existing offtake agreements, market and technical product validation by independent consultants, customer product validation, market research and market forecast data from TZMI. Pricing for Great White HRM™ is included at conservative levels due to ongoing customer validation work.
<b>Inability to attract and retain key talent</b>	A recruitment plan and incentive reward program for employees have been implemented.

TGWP top 10 Project risks currently identified in the risk register are summarised in Table 15-2 below.

**Table 15-2 The Great White Project Top 10 Risks - August 2023**

Risk	Controls
<b>Processing plant does not perform to quality expectation leading to unsaleable product leading to financial losses</b>	Proven with inhouse and external test work. Conventional proven techniques and equipment in design. Have used the pilot plant to confirm flowsheet design.
<b>Long lead times for major equipment items leads to delays in construction and project commencement</b>	Long lead time item procurement underway. Prioritisation of equipment orders based on delivery time and price with second-hand equipment being considered where appropriate.
<b>Unable to obtain water supply contract to supply Project from SA Water</b>	Ongoing engagement with SA Water. Understanding of where standpipes are located for trucking water in.
<b>Insufficient design standard results in operating failures</b>	Designed to Australian standards by qualified and competent engineers. No novel or bespoke equipment in the design. All equipment purchased through rigorous and detailed procurement process.

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<p><b>Vehicle accident on site leads to impacts to incident/fatality</b></p>	<p>Traffic management protocols and systems will be in place across site. Separation of LV and HV traffic in site layout and road design. On site driving induction and licensed operators. Drug and alcohol testing, and fatigue management procedures in place.</p>
<p><b>Vehicle accident off-site leads to impacts to incident/fatality</b></p>	<p>Protocols around road use times. Driver training. Company supplied bus transport will be available to and from site for shift workers.</p>
<p><b>Unable to supply power on site</b></p>	<p>Purchase contract for microturbines currently planned and engagement underway with vendors. Backup plans such as diesel generators in place.</p>
<p><b>Unsafe design not complying with legal requirements to duty of care</b></p>	<p>HAZOP to be carried out in detailed design. Independent experienced engineers designing the plant to Australian Standards. QA/QC including Hold Points included in procurement plans for checks prior to commissioning.</p>
<p><b>Inaccurate scheduling leads to project overrun and budget implications.</b></p>	<p>Engage appropriate resources as required. Active and approved project management plans in place. Contingency included where required.</p>
<p><b>Long lead items delivered before site is ready for installation resulting in fees for storage and expiry of warranty/production guarantees before commissioning and stable operation</b></p>	<p>Long Lead Item procurement dynamic in line with project schedule. Ongoing communication between engineers and procurement teams. Contracts will be written to account for potential storage before installation and discussions ongoing with existing suppliers both in Adelaide and Streaky Bay.</p>

The risk register will be updated throughout the continued development of The Project to reflect the scope of work being pursued at any point in time and how the risk may impact various stages of development.

## 16 Competent Persons Statement

*The data in this report that relates to Mineral Resource Estimates for the Great White Kaolin Resource is based on information evaluated by Mr Eric Whittaker who is a Member of the Australasian Institute of Mining and Metallurgy (MAusIMM). Mr Whittaker is the Chief Geologist of Andromeda Metals Limited and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activity which he is undertaking to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"). Mr Whittaker has 30 years of experience in the mining industry. Mr Whittaker consents to the information in the form and context in which it appears. Mr Whittaker holds Performance Rights in the Company and is entitled to participate in Andromeda's employee incentive plan.*

*The data in this report that relates to Mineral Reserve Estimates for the Great White Kaolin Resource is based on information evaluated by Mr John Millbank who is a Member of the Australasian Institute of Mining and Metallurgy (MAusIMM). Mr Millbank is the Director of Proactive Mining Solutions Pty Ltd, an independent mining consultancy, and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration,*



and to the activity which he is undertaking, to qualify as a Competent Person as defined in the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves (the "JORC Code"). Mr Millbank consents to the information contained in this report being used in the form and context in which it appears. Mr Millbank, or any of the entities he directly controls, has no financial interests in Andromeda Metals Ltd or any of its subsidiaries.

## 17 Consultants and Contributors

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